THE IRON TRADE REVIEW

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Good Progress Made During May

And Outlook for June is Favorable—High Price of Spelter Results in Rapid Advances in Galvanized Products

Improvement continues to be reported by the United States Steel Corporation, which is still operating at about 80 per cent of ingot capacity, and by most independent steel companies, and as order books are getting gradually into better condition, the tendency is toward greater firmness in prices, but irregularities have not entirely disappeared. On the whole, the month of May recorded substantial progress and the outlook is that June will do as well as May.

Pig iron production for May was 2,250,556 tons, a gain of 136,038 tons over April. A gain of 755,000 tons, or 50 per cent, has been made since the low production of last December.

Iron Ore

The movement of iron ore from Lake Superior mines in May was larger than expected, being 5,012,387 tons. This is a gain of 1,160,294 tons over May, 1914, but it is less than the heavy movement of May, 1913, by 2,271,825 tons. Up to June 1, the shipments amounted to 5,516,189 tons, compared with 4,121,749 tons in 1914 and 8,150,599 tons in 1913. Doubtless a considerable tonnage has not been moved on account of the desire to take advantage of the 5-cent reduction in ore-carrying charge from Mesabi mines to docks.

Pig Iron

Aside from the purchase of 20,000 tons of basic by the Carbon Steel Co., there have been no large tonnages reported, but there has been some quiet buying, including additional purchases for investment. On a sale of 1,000 tons of basic for prompt delivery in eastern Pennsylvania, an advance of 50 cents over recent quotations was obtained.

Machinery

The demand for lathes and other machine tools for use in the manufacture of war materials is more insistent and in some cases large premiums are being offered for prompt shipment. Manufacturers are unable to meet the demand. The General Electric Co. has ordered several hundred more machine tools for manufacturing shrapnel. The Bethlehem Steel Co. has placed additional orders for equipment, and the Westinghouse companies, the Union Switch & Signal Co. and other important manufacturers are still in the market for large quantities of machinery. In Cincinnati, inquiries for 300 lathes for Italy are pending. Pittsburgh machine tool dealers are breaking all records.

Coke

The entrance of Italy into the war has not yet resulted in any large number of Italians leaving the coke regions and there is at present a slight surplus of labor. Reports from blast furnaces and mills do not indicate that many Italians are starting for their native land.

Galvanized Products

The unprecedentedly high price of spelter, due largely, if not entirely, to the heavy demand for export, has resulted in sharp advances in the price of galvanized products, in the making of which spelter is extensively used. The price of galvanized pipe has been advanced $10 per ton. The American Steel & Wire Co. and other wire companies have advanced the extras for wire products $4 per ton. Prices of galvanized sheets have been rapidly advanced and many important makers have withdrawn from the market. The fact that many sheets mills have stopped turning out the galvanized product has not, however, caused much increase in the demand for black sheets, which are now being made in larger quantities and being sold at lower prices than have recently prevailed.

Scrap

The government has issued very definite instructions that none of the 27,000 tons of scrap from the Panama canal, on which bids are to be received June 7, shall be shipped to any of the belligerent countries. If an attempt is made, the scrap will be confiscated. It had been considered probable that a large part of this old material would find its way to Italy.

MEN OF MACHINERY TRADE

Who they are Where they are What they are doing

Arthur Putnam Scott, who has recently been appointed head of the metallurgical department of the Snyder Electric Furnace Co., Chicago, has had a career that places him in the foremost rank of present-day metallurgists. Mr. Scott is a Nova Scotian, eldest son of the Rev. E. Scott, of Montreal. He graduated from McGill University, Montreal, and was awarded the Logan gold medal for natural sciences in 1896 and the British Association medal in chemistry and metallurgy in 1898. Following his graduation, he remained at the university as demonstrator in chemistry until the spring of 1899 when he accepted the position of assistant chemist with the Dominion Iron & Steel Co., Sydney, N. S., becoming chief chemist and assistant metallurgist of that company in 1904. He resigned this post in 1908 to enter the service of the General Electric Co., as representative metallurgist at the Brackenridge plant of the Allegheny Steel Co. He remained at Brackenridge until 1911 when he was recalled to Sydney as metallurgist and superintendent of the steel department of the Dominion Iron & Steel Co. In February of the present year he severed his connection with the Dominion company and took up consulting work with headquarters in Montreal. In the course of his metallurgical duties, Mr. Scott has spent considerable time at various European steel plants. He received the degree of Master of Science from McGill University in 1914.

D. S. Woods, formerly Philadelphia salesman for Niles-Bement-Pond Co., Inc., has been transferred to the New York office.

Reginald J. S. Pigott is severing his connection with the Interborough Rapid Transit Co., New York, as mechanical construction engineer, to take up the position of power engineer for the Remington Arms-Union Metallic Cartridge Co., Bridgeport, Conn.

Claude A. Bulkeley has accepted the position of chief consulting engineer with the Canadian Domestic Engineering Co., Ltd., Montreal, Que., Can. Until recently Mr. Bulkeley practiced consulting mechanical and electrical engineering in New York City.

W. L. Clark, formerly vice president of Niles-Bement-Pond, Inc., and for the past few months connected with the purchasing department of J. P. Morgan & Co., New York, has severed this connection to go with the Westinghouse Electric & Mfg. Co.

Merton A. Pocock has been appointed district sales manager for the Terry Steam Turbine Co., Hartford, Conn., in the territory included in the states of Minnesota, North Dakota and South Dakota, with office at 400 Endicott building, St. Paul. The Terry

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company was formerly represented in this territory by the Robinson, Cary & Sands Co., St. Paul. Hawkins-Hamilton Co., Peoples National Bank building, Lynchburg, Va., has been made selling agent for the Terry line in the state of Virginia.

Philip B. Gale, vice president, secretary and general manager of the Hartford Machine Screw Co., Hartford, Conn., has been elected first vice president of the Standard Screw Co., which controls several concerns in New England and in other localities in the United States.

O. L. Remington, general manager, and H. P. McColl, engineer, representing William McLean & Co., engineers and importers, Melbourne, Australia, are now in the United States on business with iron, steel and machinery companies. Mr. McColl's address is Hotel La Salle, Chicago.

A. H. Hall, formerly Chicago sales manager for the Hendey Machine Co., Torrington, Conn., has been transferred to take charge of the New York office of that company. F. L. Peterson, formerly assistant to Mr. Hall, has been promoted to the position of manager of the Chicago office.

E. E. Winship, formerly manager of the Cincinnati branch of Manning, Maxwell & Moore, Inc., was appointed manager of the Cleveland branch, effective May 1. C. H. Overkamp, formerly of the Conover-Overkamp Machine Tool Co., Dayton, O., has been made manager of the Cincinnati office.

J. A. Post Van Der Burg, managing director, Post Van Der Burg & Co., with head offices at 11-13 Willemsplein, Rotterdam, Holland, is traveling in the United States making agency connections. He was a guest at the recent convention of the National Machine Tool Builders' Association at Atlantic City.

Herbert C. Barnes, for the past six years connected with the Standard Roller Bearing Co., Philadelphia, Pa., formerly in charge of the tool and machine design department and later in charge of production, has resigned his position with that company to become general superintendent of the Apple Electric Co., Newark, N. J.

L. E. Guillot and L. P. Chartier, both of Paris, who are on a visit to the United States in buying machinery for the manufacture of shells, have inspected many plants in New England recently to check up the execution of orders which were placed through American agents in France several months ago. They will return to Paris within a few weeks, and in the meantime are making their headquarters in New York.

Robert N. Fairbanks, director of W. Bayliss & Co., Ltd., London, Eng., who came to this country some months ago to make arrangements for the representation of American manufacturers in foreign countries, has returned from a trip to England where he went in connection with the business of his company. Mr. Fairbanks is making his headquarters at the New York office of the Brown Hoisting Machinery Co., 50 Church street.

Fighters Clamor for More Tools

Demand for Machinery for Manufacture of War Munitions Greatly Exceeds Supply —Orders Involving Millions Turned Down—Domestic Market Stronger

HEAVY purchases of machine tools for use in the manufacture of munitions of war continued to feature the market during the month of May. The sold-up condition which had been reflected in previous months in such tools as lathes, screw machines, automatics, etc., became exceedingly acute in May, and it is safe to say that the business placed during the month was not nearly as large as would have been placed had dealers and manufacturers been able to fill the demand. For instance, one large dealer was forced to decline orders which were cabled from abroad for more than 300 lathes because he did not have them for nearby shipment. Prospective buyers have been offering huge premiums for lathes for early delivery and these have led machinery dealers to make unremitting efforts to gather in all the second hand machines possible. So thoroughly has the market been cleaned up by these tactics that to succeed in picking up a single second hand lathe now is considered a stroke of fortune. The inability to secure lathes for early delivery has led to the placing of a large amount of business for future delivery, and as a result lathe manufacturers in many cases have disposed of the greater part of their output over the remainder of the year. In fact, all kinds of machines used in the manufacture of war supplies are sold up months ahead.

Active Demand from Italy

ONE of the features of the month was the big demand from Italy which set in immediately after it became apparent that that country would join in the hostilities. Inquiries involving hundreds of machine tools were cabled over, and a great many firm orders also were received by cable. These, of course, had to be declined by the recipients here, on account of the inability to ship. It is expected that as soon as buyers in Italy become thoroughly acquainted with conditions here, a great deal of business will be placed for future delivery; during the last few days, in fact, cables have been received from that country involving hundreds of machines for shipment within the next three or four months. During the month, a large export business continued to be booked from Great Britain, Russia and France; the demand from the latter country was especially urgent. During the month there was a continued exceedingly large demand from Canada.

Among the important domestic buyers during the month were the three Westinghouse interests, which have booked a huge new rifle contract, and also some new shell contracts. These interests continue in the market for equipment of all kinds. To enlarge its output of rifles so as to fulfill its contract the Westinghouse Electric & Mfg. Co. has leased the plant of the J. Stevens Arm & Tool Co. and the Stevens-Duryea Co., at Chicopee Falls and East Springfield, Mass., which it will equip with the necessary machinery. Another exceedingly large buyer was the Baldwin Locomotive Works, which has large contracts for making both rifles and shells. This concern let a contract for an addition at its Eddystone, Pa., plant, which will require 9,000 tons of structural steel. The Crucible Steel Co. of America broke ground at Harrison, N. J., for an immense addition involving 4,000 tons of structural steel. This company bought a large number of projectile lathes and some 17 cranes for the new buildings. The General Electric Co. bought an additional large quantity of equipment for manufacturing shrapnel. Among other large war buyers were the Fox Gun Co., Philadelphia; the Harrisburg Pipe & Pipe Bending Co., Harrisburg, Pa.; the American Locomotive Co.; the National Recording & Computing Machine Co., Dayton, O.; the Nathan Mfg. Co.; the New York Air Brake Co.; the Remington Union Metallic Cartridge Co., Bridgeport, Conn.; the Winchester Repeating Arms Co., New Haven, Conn.; the Poole Engineering Co., Woodberry, Md.; the Providence Engineering Co., Providence, R. I.; the Laconia Car Co., Laconia, N. H.; the East Jersey Pipe Co., Paterson, N. J.; the Canadian General Electric Co.; the Tredegar Iron Works, Richmond, Va.; the Toledo Bridge & Crane Co., Toledo, O.; the Locomobile Co. of America, Bridgeport, Conn.; the E. W. Bliss Co., Brooklyn, N. Y.; the Bethlehem Steel Co. and others.

Machines for Making Munitions

ONE of the interesting inquiries which came out during the month was one from J. S. Hopper, 140 Broadway, New York, involving about 1,000 machines for making rifles. C. K. Turner & Son, 116 Broad street, J. S. Johnston & Co., 68 Broad street, E. R. Caldwell & Co., 25 Broad street, New York, and others put out big inquiries on equipment for making projectiles. W. E. Welborne, Hotel McAlpin, New York, inquired on a large number of lathes and milling machines for export to Russia. Among concerns which were figuring on war contracts or inquired for equipment for making war materials were Bartlett, Hayward & Co., Baltimore; Clark Bros., Olean, N. Y.; the Carpenter Steel Co., Reading, Pa.; the Hall Switch & Signal Co.; the Nashua Mfg. Co., Nashua, N. H.; the Morgan Engineering Co., Alliance, O.; the Steel Furnishing Co., New Glasgow, N. S., and others.

Domestic Demand Improves

DOMESTIC demand showed an improvement all through the country, as far as industrial buyers were concerned. The railroads did not figure actively as buyers of machinery. The only important railroad buying was the Missouri, Oklahoma & Gulf, which closed on a large list. The Santa Fe, the Seaboard Air Line, the Delaware, Lackawanna & Western and a few other roads closed on a few tools. Some good-sized lists are expected out shortly, however, from several railroads, and other roads are inquiring in a preliminary way on scattered requirements. The market for cranes was quiet during the month, the most important letting being that of the Crucible Steel Co. of America, mentioned above. The McKeesport Tin Plate Co., McKeesport, Pa., sent out preliminary inquiries on nine cranes. This company is expected also to inquire for a number of mills. The Wheeling Steel & Iron Co., Wheeling, W. Va., ordered two 28-inch mills and shearing equipment from the Wheeling Mold & Foundry Co. The Aluminum Co. of America placed an order for four stands of strip rolls and a shear with the Lewis Foundry & Machine Co.

THE OPEN HEARTH

The Iron Country Today---A Claim Office in Which Claims Are Almost Forgotten

A VISIT to the claim office of the Oliver Iron Mining Co., of the Steel Corporation's Minnesota railroads and the Minnesota Steel Co., in the Wolvin building at Duluth, discloses in a very impressive manner the progress that is being made in the safety first movement. Indeed if one were to drop into that office without knowing that it is the place in which the claims for damages from companies hiring many thousands of men are disposed of, he would not suspect that it is anything but the headquarters for promoting the safety of employes. All about the large office of Edward H. Windom, the general claim agent, are photographs of safety devices, safety devices themselves, and all sorts of things relating to the prevention of accidents. And this collection does not, in fact, give a misleading impression, for the days of lawsuits are over to a very large extent. Claims are speedily adjusted and the energy of the office is devoted very largely to the prevention of accidents. Mr. Windom has conducted this work for many years with such sound common sense and such real sympathy for the unfortunate that seldom is there a case in which an appeal to the courts is necessary. Of course there are exceptions. Now and then an impostor must be dealt with. In the office are a pair of crutches which cost the Steel Corporation $1,000, the amount which was paid to one of the most remarkable impostors ever known in this country. He could deceive the ablest surgeons, but finally through Mr. Windom's efforts, was convicted and sent to the penitentiary.

Edward H. Windom is of the type of men in the Lake Superior region who are little known beyond its confines, but are rendering service of great value, not only to their employers, but to the employes and to the public in general. Another man of this type is John H. Hearding, assistant general manager of the Oliver Iron Mining Co. For years, Mr. Hearding has been a power on the iron ranges. He has not been satisfied with merely discharging the duties of his position as a mining superintendent or manager, but has entered into the life of the people, and particularly in improving the schools in the iron country has he proved himself a very valuable citizen. He does not believe in the extravagance which has been indulged in by some of the towns in erecting expensive school buildings, but he does believe in providing first class schools for the children of the miners.

Verily the strength of the iron country is not entirely in its ore deposits, but principally in its men.

Judge Gary's Address

THE opinions expressed by Judge Gary in his notable address at the meeting of the American Iron and Steel Institute last week divide themselves naturally into two classes, those in which the judge is cautious, and those in which he is positive. In speaking of business conditions, Judge Gary realizes the uncertainties of today and fully appreciates that when one is confronted by such unprecedented events as those connected with the European war, it is not safe to indulge in prophecy.

In dealing, however, with matters of national and international importance outside the immediate realm of business, Judge Gary displays intense patriotism and positive convictions. Setting aside all differences with the President on economic questions, Judge Gary unreservedly commends the Wilson foreign policy and declares that every duty devolved upon the United States has been performed. He has no patience with the criticisms sometimes heard in the past that our government should have done a great deal more protesting and meddling in foreign affairs.

Judge Gary is frank almost to the point of bluntness when he says that it is unthinkable that the United States should become involved in war with any of the foreign countries at this time, for he declares that we have neither the inclination nor the ability to engage in war. In other words, he admits that the United States

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is unprepared, and then he urges the importance of preparation, especially as to the navy. In declaring that the United States must have a navy at least as strong as that of any other nation, Judge Gary takes what would generally be considered an extreme view. There are indeed few people who believe that this country should have as powerful a navy as that of Great Britain.

In his attitude toward all the nations at war, Judge Gary's expressions are those of a true American. He shows no bitterness, he takes no side, he wishes to see no nation obliterated. He extends to the people of all foreign countries the hand of business friendship and asks for their friendship in return. This is indeed the attitude of a big man and is worthy of the country's greatest industry.

Progress in Gear Cutting

AMONG the various developments in machine tool design and construction which loom on the horizon in this country, the most important are those which shortly may be expected in the field of gear cutting. This country has not been in the lead in the manufacture and design of gear cutting apparatus and this is particularly true with reference to the gear hobbing machine, which was originated and perfected abroad. American designers have produced the well-known single and double disc cutter machines in which the blanks are supported by arbors toward which the cutters feed axially; the gear shaper; the reciprocating bevel gear planer; the double helical gear planer and other types which have met with great success and have been copied more or less extensively by foreign makers. In contrast to these machines, however, is the hobbing machine, which is the most universal gear cutting machine yet devised, and which most gear experts regard as embodying the ideal gear cutting principle—namely, that of generating one screw with another. The gear hobber may be employed to equal advantage in cutting practically all forms of gears. By reason of its wide range of usefulness, therefore, the hobbing machine has enjoyed a certain degree of popularity denied to other machines not so widely adaptable.

The development of the hobbing machine in this country, unfortunately, has been retarded by the fact that its most desirable component feature has not been available for incorporation in American design. This feature is the differential drive mechanism for combining the indexing and helical feeding movements, which was invented by the German, Pfauter. By consulting simple tables, the differential mechanism, which is located between the main drive and the dividing gears, may be provided with the proper change gears for automatically cutting helical gears having any number of teeth, and any angle or pitch desired. American manufacturers of hobbing machines have sought to replace the differential drive by combinations of plain change gears, connecting the feed and indexing mechanisms, which may be utilized for the production of helical gears. The great disadvantage under which they labor, however, is that these change gear combinations do not admit of the compilation of such tables as render the use of the Pfauter differential so simple. With such combinations, in fact, it is necessary to make laborious calculations and change the entire train of change gears for every variation in number of teeth and for every feed.

The German patent on this differential drive expired about two years ago and since then this feature has been incorporated in the hobbing machines manufactured by several other German makers. Up until the outbreak of the war, these machines found a ready sale in this country; at the present time, it is impossible to import them. This condition naturally adds to the importance of the fact that the American patent rights to the Pfauter differential mechanism have about run their course, being due to expire at the end of 1916, and it is safe to assume that the American manufacturers of hobbing machines at that time will adopt this device for cutting helical gears. In fact, it is generally believed that at least one large manufacturer of hobbing machines in this country now has plans under way for putting on the market an American-made machine equipped with differential drive.

Prices Present and Past

Quotations on leading products June 2, average for May, 1915, average for March, 1915, and average for June, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices June 2, 1915.	Average for May, 1915.	Average for March, 1915.	Aver. for June, 1914.
Bessemer pig iron, Pittsburgh..	$14.55	$14.55	$14.55	$14.90
Basic pig iron, Pittsburgh.....	13.60	13.45	13.45	13.90
No. 2 Fdy. pig iron, Pittsburgh	13.45	13.45	13.45	13.90
Northern No. 2 Fdy., Chgo....	13.00	13.00	14.25	14.25
Lake Superior Charcoal, Chgo..	15.75	15.25	15.50	15.75
Malleable, Bessemer, Chgo.....	13.00	13.00	14.25	14.25
Southern No. 2, Birmingham...	9.75	9.50	9.50	10.50
Southern Ohio No. 2, Ironton.	12.50	12.75	12.75	13.50
Basic, eastern Pa.....	13.50	13.25	13.50	14.00
No. 2X Virginia furnace.....	12.50	12.50	12.50	12.50
No. 2X foundry, Philadelphia..	14.25	14.25	14.25	14.75
Ferro mang., Balt., (prompt)..	100.00	100.00	78.00	38.00
Billets, Pbgh.	19.00	19.50	19.50	19.75
Sheet bars, Pbgh.....	20.00	20.00	20.00	20.75
Steel bars, Chicago.....	1.39	1.39	1.38	1.28
Steel bars, Pittsburgh.....	1.20	1.20	1.15	1.115
Iron bars, Philadelphia.....	1.17	1.17	1.12	1.17
Iron bars, Cleveland, local del'y	1.20	1.20	1.15	1.20
Iron bars, Chgo. mill.....	1.15	1.15	1.17	1.10

	Prices June 2, 1915.	Average for May, 1915.	Average for March, 1915.	Aver. for June, 1914.
Beams, Chicago	$1.39	$1.34	$1.43	$1.28
Beams, Pittsburgh	1.20	1.20	1.15	1.115
Beams, Philadelphia	1.359	1.359	1.25	1.25
Tank plates, Pittsburgh.....	1.20	1.125	1.125	1.10
Tank plates, Chicago.....	1.29	1.29	1.38	1.28
Tank plates, Philadelphia.....	1.359	1.359	1.259	1.25
Sheets, blk., No. 28, Pittsburgh	1.80	1.80	1.80	1.82
Sheets, blue an., No. 10, Pbgh.	1.35	1.35	1.30	1.35
Sheets, galv., Nov. 28, Pbgh...	4.25	3.40	3.40	2.77
Wire nails, Pittsburgh.....	1.55	1.55	1.60	1.50
Connellsville fur. coke contr...	1.65	1.65	1.65	1.85
Connellsville fdy. coke, contr...	2.25	2.25	2.25	2.35
Heavy melting steel, Pbgh....	11.75	11.75	12.00	12.00
Heavy melting steel, east'n Pa.	11.00	11.25	11.00	10.75
Heavy melting steel, Chgo.....	9.25	9.25	9.89	9.75
No. 1 wrought eastern Pa.....	12.50	12.50	12.50	12.50
No. 1 wrought, Chgo.....	8.75	8.75	9.00	8.88
Rerolling rails, Chgo.....	10.00	10.00	11.25	11.25
Car wheels, Chgo.....	9.75	9.75	11.75	11.25

(For Additional Prices See Page 1138.)

Carbon Steel Co. Buys Basic Pig

Taking 20,000 Tons at About $12.50, Valley—Tonnages Booked by Some Leading Sellers in May Exceed Those of April

Pittsburgh, June 1.—The Carbon Steel Co. has closed negotiations for 20,000 tons of standard basic for last half delivery, on the basis of about $12.50, valley. At least part of the tonnage will be furnished by a nearby blast furnace stack. No other important transactions have been closed, so far as known. For the first time in about six months, steel making grades advanced in price in May, according to averages compiled by W. P. Snyder & Co. Bessemer averaged $13.659, or about 6 cents above the previously prevailing average price for several months. Basic averaged $12.65, valley, or 15 cents above the price recorded the last six months. Averages are based on sales of 1,000 tons or more by valley furnaces. The Carnegie Steel Co. now is operating 42 of its 69 blast furnaces, an increase of 18 compared with the low point in December. No change in the position of prices for foundry grades is noted.

Buying for Investment

New York, June 1.—Filling in purchases continue to afford the chief tonnage in the iron market in this district, and in New England territory. Otherwise the situation is quiet and buyers are not doing much more than drawing upon their old contracts which they are doing quite well. Some further buying of pig iron by New York capitalists for investment is developing and some good tonnages of southern are involved. These negotiations are being carried on by different investors than those who recently made round-lot purchases. A Connecticut foundry took 1,000 tons of foundry iron additional and a New Jersey shop closed for 500 tons of No. 1X for shipment this year. A Cartaret, N. J., buyer still is out for 500 to 1,000 tons, another consumer in this territory for 1,500 to 2,000 tons and there are some smaller matters before sellers. Prices are unchanged at around $14.25, tidewater, for No. 2X. A little additional export business had been done. This involves 1,500 tons of southern foundry and northern low phosphorus and bessemer to go to a northern European country. The export price on bessemer now is around $15.50, tidewater. An inquiry for 2,000 tons of bessemer for Italy was put out this week.

May Exceeded April

Cleveland, June 1.—One Cleveland firm sold over 100,000 tons in May, making a fair gain over April, and other sellers report similar experiences. No noteworthy tonnages have, however, been sold during the past week and no important inquiries are pending. Shipments are going forward satisfactorily.

More Melters Taking Iron

Buffalo, June 1.—Furnace interests in the Buffalo district report a growing number of users who are anticipating on their contract deliveries. Shipments of iron under contract are increasing. Advantage has been taken of the opening of the Erie canal and a heavy movement of iron via the trans-state waterway is being made.

There is little or no activity in the way of inquiry or sales. Aside from the heavy specifying, the market is practically featureless. The few sales that have been made in the past week have been for small tonnages.

The price situation remains about the same as previously reported. If anything, there has been a disposition on the part of a producer to accept the minimum rather than the maximum of the prices quoted for some weeks, namely $12.50 to $13.50, with an absence of grade differentials. The price of $12.50 to $13, showing a narrowing of the spread, with no reduction of the minimum figure, more nearly covers the market. All of the producers of the district are not accept-

(*For complete prices see page* 1138.)

ing business on a basis of slightly softer prices.

Some of the furnace interests feel that the continued heavy demand for iron under contract to the extent of anticipating deliveries, indicates a rate of consumption that will sooner or later develop into a demand for iron that will be followed by a stiffening in prices.

Chicago Market Quiet

Chicago, June 1.—Figures on sales of pig iron during May in this territory have not been compiled, but indications are that the month will show considerably heavier bookings than April, which in itself was much stronger than March. Some dealers believe their sales were almost double those of April. At the beginning of this month, inquiry is somewhat less than has been the case recently, but this is due in part to the holiday and probably will not continue. Only one inquiry, involving 1,000 tons, is now current and most other business is for much smaller tonnages. No difficulty is experienced in maintaining quotations at $13, Chicago furnace, and extras for added silicon are obtained more easily as the weeks pass. Southern iron is scarcely holding its own and the recent advance to $10, Birmingham, for No. 2 foundry, has been weakened in a number of instances, although the volume of business is not sufficient to give a fair test.

Market Drags

Cincinnati, June 1.—Tentative inquiries for silvery iron continue to come into the market, and in a few cases light tonnages have been sold. Inquiry for foundry iron is very light, and sales of malleable iron have dropped to a minimum. The quiet condition of the market does not appear to have resulted from refusal of buyers to pay present prices, but rather from the fact that very few melters in this territory are in need of iron for the third quarter. A better buying movement is looked for by dealers before the beginning of the fourth quarter, as they believe that a number of users have not covered for the entire last half. The decline of southern Ohio No. 2 foundry iron to $12.50, Ironton basis, for the last half, which occurred several weeks ago, has not increased buying for this grade. One furnace in the Hanging Rock district is holding firmly at $12.75, Ironton basis, for this grade. A small amount of southern No. 2 foundry can be had at $9.50, Birmingham basis, for prompt shipment only, and when spot cash can be paid. Otherwise, the prevailing quotations are from $9.75 to $10, Birmingham basis, for any delivery during the last half. Southern Ohio 8 per cent silicon is quoted at from $14.50 to $15, furnace.

Market Without Feature.

Birmingham, Ala., June 1.—Makers in the Birmingham district continue to sell more than their production, but the market is quiet and without feature. A steady, healthy business appears to be prevailing in the pig iron market, with prices stationary, but strong at $9.75 for No. 2 foundry for immediate delivery and $10 for second half delivery.

Basic Advances

Philadelphia, June 1.—Basic pig iron has scored an advance of about 50 cents in eastern Pennsylvania on the basis of a transaction just made and on the quotations now being made by makers. An Ivy Rock, Pa., steel maker who entered the market rather than blow in another furnace bought 1,000 tons of this grade for immediate delivery at a shade below $13.75, delivered. This compares with $13.15 and $13.25, delivered, paid by the Lukens Iron & Steel Co. on a large block several weeks ago, which was the last previous transaction. Some makers now are stating they would not sell at less than $14, delivered, for forward shipment. A Harrisburg consumer has arranged for some tonnage of basic under special conditions. A 3,000-ton inquiry for Phoenixville has been withdrawn. In foundry iron, there also is a disposition among certain eastern Pennsylvania furnaces to hold for better prices. This especially applies to one or two of the interests which have been low sellers. The Philadelphia market still may be quoted around $14.25 for No. 2X, however. The demand for foundry iron in new orders is limited, but old orders are being taken out very freely and in some cases there are anticipations. The demand for low phosphorus appears to be reviving among the shops manufacturing railroad material, and war orders undoubtedly also are playing a part in these. In some districts, prices of this grade are higher, but they are unchanged in this district. An eastern maker has sold 2,000 to 3,000 tons to a Canadian buyer.

Galvanized Pipe Advanced

Pittsburgh, June 1. — All makers of iron and steel pipe have advanced quotations for galvanized tubular goods five points or $10 a ton. The advance was caused by the abnormally high price for spelter. The last previous advance was announced May 1, when the National Tube Co. boosted prices for black and galvanized products $2 a ton. On Feb. 11, black pipe was advanced $2 a ton and galvanized from $2 to $6 a ton. No large orders for pipe have been placed this week in the open market.

(*For complete prices see page* 1138.)

Billet Inquiry

From Near Pittsburgh District Reaches the Eastern Market

Philadelphia, June 1.—A large demand for open hearth steel which has resulted from the strict requirement of this grade in the numerous orders for shrapnel and other shell bars recently placed, is beginning to occasion a tightening of the supply with some makers. In regular domestic business, bar makers usually have had the option of shipping either bessemer or open hearth. It is understood, some steel makers have been inquiring of other works and supplement their own output of open hearth metal. Eastern Pennsylvania steel makers have noted this turn to the situation in the receipt of a large inquiry for open hearth billets from territory contiguous to the Pittsburg district. The eastern billet market shows a better domestic demand made up of smaller tonnages. A Richmond, Va., buyer who asked 500 tons has withdrawn this inquiry. Foreign orders continue to come weekly to eastern Pennsylvania makers, one lot of the past week being 500 tons for the British Isles. Home buyers seem more willing to pay what eastern makers are asking which is $19.50, Pittburgh, or $22.06, Philadelphia, for rolling and $3 to $4 a ton higher for forging steel.

Ask Higher Prices

Pittsburgh, June 1.—Sellers of sheet bars and billets in the Greater Pittsburgh district are quoting advanced prices for these products and it is understood sheet bars have been sold at as high as $22, Pittsburgh, or $1 a ton above what had been considered the top of the market. Youngstown mills are quoting products at advanced quotations and minimum figures seem to have disappeared at that center. Demand for wire rods for export is heavy. Mills are unable to promise anything like prompt shipment despite rather fancy prices offered by foreign interests. Wire rods for the domestic trade are quoted at from $25 to $26, Pittsburgh. Muck bar is held at $27, Pittsburgh.

James Rushworth has been appointed general manager and secretary of the Aurora Tool Works Co., manufacturer of upright drill presses, Aurora, Ill.

War Orders for Bars

Swell the Business of Many Mills--Agricultural Implement Makers Still Hesitate

Pittsburgh, June 1.—The placing of heavy tonnages of war material has benefited bar mills to a considerable extent. Bar mill departments of the more important plants are operating at practically maximum capacity and some interests produced slightly above 90 per cent of their theoretical output in May. It is reported that one of the car builders in this district has taken a contract for 100,000 large shells, but this report is not confirmed. Steel bars for prompt shipment are firm at 1.20c. Iron bars are being held at 1.25c by most makers.

Many Not Closed

New York, June 1.—Large implement manufacturers in the Chicago and farther western territory have not yet closed on the proposition of the mills to sell them their last half bar requirements for 1.20c, Pittsburgh. It is learned, however, that some of the smaller buyers in Cleveland and Cincinnati territory have closed on this basis. The recent award of shrapnel bars by the New York Air Brake Co. to the Carnegie Steel Co. totals 18,000 tons instead of a smaller amount previously reported. Other shrapnel bars are in the market. Specifications in this district continue fair. Prices are firm at 1.20c, Pittsburgh, or 1.369c, New York, for second quarter.

War Material Pending

Cleveland, June 1. — A Cleveland company has named a price on a part of the 135,000 tons of 3½-inch rounds reported in these columns last week as pending for shipment to England. It is understood that several of the large steel companies in Pittsburgh and east of that city are bidding on this business and it is doubtful whether any of it will come to Cleveland. Bar prices are being well maintained in this section and some contracts with agricultural implement manufacturers have been made at 1.20c, Pittsburgh, for the six months ending Jan. 1, 1916.

More Inquiry at Buffalo

Buffalo, June 1.—Mills and agencies of the Buffalo district report an increase in the inquiry for bar material for third and fourth quarter. The price of 1.25c for third quarter and 1.30c for fourth quarter is being asked by most interests with some quoting 1.25c for last half. Several instances of concession prices being offered have come to light, but it is believed all the larger producers are firm in their prices while the concessions have come from small eastern mills.

Inquiries are coming in from the Canadian market for prices and deliveries on large rounds to be used for the making of shrapnel for the French government. Canadian mills are unable to meet the demands of the British and the French governments. The Steel Co. of Canada is to devote its bar mills exclusively to the rolling of war materials, it is reported.

Agricultural Buyers Hesitate

Chicago, June 1.—Something of a lull is being experienced in the market for steel bars in this territory on the part of some sellers. Agricultural implement makers are still hesitating over closing in the hope they may yet obtain contracts for 12 months from July 1, instead of six months, as barmakers at present insist is their limit. Prices apparently have been threshed out and contracts will be on a basis of 1.39c, Chicago mill, for the last half of the calendar year. Makers are presenting a stone wall in their adherence to the six months' contract and show no signs of weakening under the pressure brought to bear by implement makers. Some of the hesitancy over buying at present is also attributed to the fact that railroads and other users of steel close their fiscal years June 30 and devote considerable of the present month to inventory. As a result, they are not buying or specifying as heavily as usual in order to have inventory show as little excess material as possible.

Other sellers find business increasing, one important interest here showing figures which indicate that bookings during May ran more than 1,000 tons per day in excess of April. Railroads have released considerable tonnages of rails, track fastenings and materials for car building and still other tonnages of this sort are to come out in the near future.

Iron Bars Slow

Chicago, June 1.—Bar iron mills are not increasing their operations and practically every mill in this district is idle this week. Operations have varied the past few weeks from 30 to 50 per cent and comparatively small new tonnage is being taken on. Quotations remain at 1.20c, Chicago mill, and every seller is adhering to this price, although new business is practically nil.

Heavy Specifying

Philadelphia, June 1.—Only a moderate amount of new business in steel bars is being put out in this district, apart from the 20,000 tons for shrapnel and other shells, which still are pending. Specifications have continued good, however, and have been especially brisk with some makers the past week when consumers hurried in the balances of monthly quotas. The Norfolk & Western railroad is negotiating for 250 to 300 tons for last half and bids have gone in on 230 tons of four sizes for the Panama canal. The market still hears occasional reports of price irregularity though these remain of a minor character. There has been some talk regarding the price at which the Virginian railroad recently placed 200 tons. The 1.20c, Pittsburgh, price on the whole, however, is steady and for third quarter, numerous contracts have been taken in this territory at 1.25c, Pittsburgh. The larger farming implement trade still holds off from closing for last half at 1.20c, Pittsburgh.

Hoops, Bands and Shafting

Pittsburgh, June 1.—Several prominent shafting interests have advanced quotations $1 a ton for fourth quarter delivery and are now quoting that product at 67 off for future delivery. Slight irregularity for prompt delivery, however, continues to be noted. Expressions are heard that especially desirable contracts for immediate acceptance can be placed at 69 off and possibly less. Hoops are quoted at 1.25c and bands at 1.20c for prompt delivery.

(*For complete prices see page* 1138.)

Cast Iron Pipe

Chicago, June 1.—The American Cast Iron Pipe Co. was successful in competition for 2,265 tons of 16 to 24-inch cast iron pipe for the city of Chicago last week. Bids will be opened June 7 at Milwaukee for 300 tons to be bought by a contractor and a considerable tonnage is expected to come out at Kenosha, Wis., about the middle of the month.

Bidding on cast iron pipe at present is not spirited and comparatively few projects are under consideration.

The Master Sheet Metal Workers' Association has completed arrangements to send a delegation of 50 members to the annual meeting of the Master Sheet Metal Contractors' Association of Ohio, which will be held in Dayton, O., on June 2 and 3.

Carnegie Books Plates

For Two Boats for Mexican Navigation Co. and Several Plate Makers Get Orders From American Car & Foundry Co.

Philadelphia, June 1.—Shipyard work continues to be the best producer of plate tonnage in this territory. The Carnegie Steel Co. has taken 9,000 tons in addition to the shapes for the two boats for the Mexican Navigation Co., awarded to the Cramp yard and for a tank steamship for the Petroleum Transport Co., placed with the New York Shipbuilding Co. The award of this last boat was referred to in a general way by *The Iron Trade Review* last week and its confirmation now increases the total contracts with Atlantic shipbuilders to 35. Italy, which last week asked for 6,500 tons of ship plates for three vessels, now has opened negotiations with eastern yards for the complete vessels. Other foreign boat work is talked about. The American Car & Foundry Co. late last week distributed among several makers, several thousand tons of plates additional to cover the requirements of recent Pennsylvania car contracts. This was supplemented to the plate orders by the buyer previously noted. Locomotive requirements are on a large scale, due to several good awards of the past week. A lot of 250 tons for the British Isles was booked by one eastern mill in the week. Tonnage generally with eastern makers is well maintained, although one mill started the week with less tonnage scheduled. What are purported to be old options have shown considerably below 1.20c, Pittsburgh, on large car and ship plate orders recently placed, but on strictly new business this figure generally holds.

Mills Busy

Pittsburgh, June 1.—The distribution of steel cars for the Pennsylvania railroad has materially benefited mills in this district. Some of them are operating at slightly above 90 per cent of capacity for the first time in many months. The Carnegie Steel Co. will furnish a large tonnage of the material purchased by car builders in this district. Plates are being held at 1.20c by more important makers, but that figure continues to be shaded by at least one mill in this district. Hopes are expressed that concessions no longer will be offered by the opening of the third quarter.

Inquiry for Export

Cleveland, June 1.—An inquiry for 2,560 tons of plates, 780 tons of angles and 313 tons of bars for export is pending. The inquiry was sent out without definite information as to the country to which the material is to be shipped or the purpose for which it is to be used.

Plates Still Weak

Chicago, June 1.—Conditions surrounding the steel plate market have not changed and plates may be obtained readily at 1.29c, Chicago mill, with comparatively small demand.

New Mumford Company

The E. H. Mumford Co., Elizabeth, N. J., has taken out a New Jersey charter with a capitalization of $50,000 to manufacture molding machines, etc. The incorporators are Thos. J. Mumford and Rose S. Mumford, of Plainfield, and Howard W. Conclair, of Elizabeth. The business will represent the carrying on of the plans of the late E. H. Mumford.

Heavy Car Orders Placed

Last Month and Rail Orders Also Made Better Showing—More Locomotive Orders Last Week

New York, June 1.—Car orders in May were by far the largest of any month of the present year and totaled 17,500 compared with 1,150 in April, 1,100 in March, 4,000 in February and 2,600 in January. The large increase in May was due to the 14,232 cars placed by the Pennsylvania system. At the present time, about 10,000 cars are in the market for domestic roads. Some of these inquiries are being advanced very slowly towards the order stage. Nothing further has developed with regard to the large Russian car order and about 15,000 cars remain in negotiation for that country.

May rail orders made a better showing according to the statistics of reported contracts compiled by *The Iron Trade Review*. The May orders aggregated about 140,000 tons, compared with 65,000 tons in April, 160,000 tons in March, 140,000 tons in February and 200,000 tons in January. About half the May rail tonnage was made up by export orders. The most important was about 50,000 tons for Russia including about 20,000 tons for the Chinese Eastern railway, 8,000 tons for the Central of Argentina, and other contracts.

Revised specifications issued by the Pennsylvania railroad several days ago on its 138,000-ton inquiry still are the subject of negotiations between that system and the mills. The modification of the rather drastic stipulations embodied in the earlier set of specifications was expected, as previously noted in *The Iron Trade Review* in view of the large extras asked by the manufacturers. One of the important changes in the new specifications provides for the elimination of the segregation test in the 125-pound sections, which had provided for drillings to be taken from the top and base of the head. This clause also is modified in the sections of other weights in that below standard rails according to this segregation test, will result in only the A rails being rejected, whereas formerly it called for the refusal of the whole heat.

Locomotive orders have been better the past week. The Chesapeake & Ohio placed 24 mallett type with the American Locomotive Co., and the Western Maryland 15 with the Lima Locomotive Corporation. The Lehigh Valley ordered the construction at its Sayre, Pa., shops of 11 additional, increasing those now building to 22.

Officially Confirmed

Birmingham, Ala., June 1.—Confirmation is made by the Tennessee Coal, Iron & Railroad Co. of the statement made by *The Iron Trade Review* last week, that an order from the Southern Pacific Railroad Co. had been received for 26,000 tons of steel rails to be delivered during the months of June, July and August, 1916. This is double the usual order of the Southern Pacific for the local mills, last year the order at the beginning of the year for delivery through June, July and August of this year being 15,000 tons.

Sufficient orders are booked at the Ensley rail mills, it is reported, to insure operations at the present rate throughout the summer.

William L. Cooley, construction superintendent of the Otis Elevator Co., died May 26, aged 48 years.

(*For complete prices see page* 1138.)

Galvanized Sheets Soar

Rapid Advances Made on Account of Unprecedented Price of Spelter—Shading on Black Sheets

Pittsburgh, June 1.—Galvanized sheet makers, in an effort to meet the phenomenally high price for spelter, have boosted products from $13 to $15 a ton and only limited lots are being offered at any figure. The minimum price for No. 28 gage in this district seems to be 4.25c; some mills are asking 4.50c and above and many sellers have withdrawn from the market entirely. Makers are offering substitutes for galvanized products in every possible instance. The market for black steel sheets continues to reflect irregularity, but shading appears to be confined to adjacent territory. Attempts to settle difficulties at the Martins Ferry, O., plant of the Whitaker-Glessner Co., thus far have proved futile, but mill managers hope to resume operations some time this week. Officers of the Amalgamated Association and of the American Federation of Labor, at a meeting Sunday appealed to members of the United Iron and Steel Workers Association to return to the parent organization.

Large Export Order

Pittsburgh, June 1. — The United States Steel Products Co., the export company of the Corporation, has booked an order for 275,000 boxes of tin plate for far eastern shipment at a price said to be slightly above the domestic market. Tin plate mills continue to operate at approximately maximum capacity, but low figures for immediate acceptance have not disappeared.

Good Specifications in East

Philadelphia, June 1.—Consumers continue to specify freely against sheet contracts with eastern Pennsylvania makers, many of which are on a 1.30c, Pittsburgh, basis for No. 10 gage blue annealed. On new business, which is not very large, 1.35c, Pittsburgh, usually is quoted though in some cases, to meet outside competition, this figure has been shaded $1 a ton. The eastern sheet market has a better tone.

No Galvanized Quotations

Chicago, June 1.—Makers of galvanized sheets in this district have withdrawn all quotations in view of the continued rise in spelter. The leading independent is entirely out of the market and will not take tonnages under any circumstances. Mills in Ohio with selling agencies here have withdrawn their quotations, although they expect to be able to make quotations within a fortnight after the further tendency of the spelter market is noted.

One maker of galvanized sheets has figured that if sheets at 2.70c, Pittsburgh, and spelter at 6.00c offer a profit, sheets must be sold at not lower than 4.95c, Pittsburgh, at the present price of spelter, in order to give the same profit. The higher quotation which has been made so far has been 4.00c, Pittsburgh, which is $19 per ton below the high figure just mentioned.

Black sheets No. 28 gage are obtainable readily at 1.89c, Chicago mill, but demand is not strong.

Black Sheets Irregular

Cleveland, June 1.—As the price of spelter continues to advance and the production of galvanized sheets to decline, the tonnage of black sheets on the market has increased and prices of that product show much irregularity. Efforts to induce users of galvanized sheets to substitute black sheets have not succeeded to any considerable extent.

Advance Expected

Cincinnati, June 1. — Galvanized sheets are quoted all the way from 3.60 to 3.85c, Pittsburgh basis, depending upon the time of shipment, the former price being for prompt delivery only. An advance to 4c, Pittsburgh basis, is predicted by dealers before the end of the month. Black sheets are quoted at 1.80c for prompt and at 1.85c for contract delivery, both Pittsburgh basis. Rolling mills are running full in all departments, and are accumulating stocks, as sales are light.

Warehouse Business Increases

Cleveland, June 1.—Warehouse business during May showed a very satisfactory increase over April and one large warehouse reports the heaviest sales in more than a year and a half. The prices on galvanized sheets have again advanced and from 3.90c to 4c, Pittsburgh, is now being asked for No. 28 gage.

Warehouses Advance Galvanized

Chicago, June 1.—Chicago warehouses have responded to the pressure on galvanized sheets and recently advanced from 4.00c to 4.20c and almost immediately to 4.60c for No. 28 gage. It is believed this quotation will not stand and that a higher price will be named before many days.

Demand for iron and steel products from store is strong and business is active, the only adverse factor being interference in building operations in Chicago proper, owing to labor disputes.

(*For complete prices see page* 1138.)

Slight Surplus

Of Labor in Connellsville Coke Region—No Rush of Italians to War

Pittsburgh, June 1.—The Connellsville coke regions have not yet been seriously affected by the entrance of Italy into the European war. Direct reports from Uniontown indicate that there is a slight surplus of labor in the coking fields at present. If operations are increased, say 15 per cent, it is not improbable that some embarrassment may be caused because of a labor shortage. Demand for coke, however, will have to increase substantially before additional men are needed to operate the Connellsville region ovens. The market for furnace coke shows no snap, but prices are firmly maintained. Most foundry coke consumers have covered needs for the year beginning July 1. The Connellsville *Courier* for the week ending May 22, says production was 306,691 tons, an increase of 9,137 tons compared with the week before. Production for the period mentioned was the heaviest this year.

Closes Term Contract

Philadelphia, June 1.—A Lehigh valley furnace company has renewed for a term of three years, with a Latrobe district maker, a contract for its requirements of furnace coke in which the maximum amount is placed at 8,000 tons monthly. The price is on a sliding scale basis. A similar term contract of several years' duration previously had been in force between these two companies.

Prices Firmer

Cincinnati, June 1.—Coke prices are firming up slightly, but as yet are unchanged. The aggregate of sales of foundry coke is large, as foundries are buying for next year's requirements. Furnace coke is quiet, following sales aggregating 65,000 in southern Ohio last week.

Dull at St. Louis

St. Louis, May 29.—An order was closed this week for 1,500 tons of by-product coke, and foundry and furnace grades have been in somewhat better demand on contracts. Taken altogether, however, the coke market remains dull. Foundry grades are held at $2.50 and up, according to delivery.

No Scrap for Belligerents

Panama Material Will be Seized by Uncle Sam if Shipped to Warring Nations—Prices Weaker in Some Centers

Philadelphia, June 1.—Official action has been taken by the United States government to prevent the 27,000 tons of iron and steel scrap at the Panama canal, offered for bids June 7, from being shipped to any of the belligerent nations during the progress of the war. In a supplemental communication to bidders just issued by Major D. C. Boggs, general purchasing officer, it is required that the buyers of the material shall guarantee that it will not be shipped to any belligerent nation. It is provided that if the government should learn the material is to be exported to any of these countries, it will seize the scrap and will not return the purchase price; if the material should escape the control of the government and be sent beyond its jurisdiction, the vendee will be required to pay to the latter a sum equal to the purchase price which will be held as liquidated damages. Before the issuance of these instructions, there had been some talk of exporting this metal and it had been rumored that Italian consumers were considering bidding upon it direct.

The scrap market in eastern Pennsylvania remains quiet and has developed an easier tone in some grades, notably heavy melting steel. One steel maker in the week had no difficulty in taking on 1,500 tons or more, partly at $11, delivered, and the balance under rather special conditions at below that price. As recently noted, there have been local transactions in steel at $10.50 and $10.75, South Bethlehem. A sale of borings was done at $8.50, delivered. Stove plate is easier with the withdrawal of the principal buyer here. There is a good demand for low phosphorus scrap. Italy has been offering 105s or about $25.20, delivered, for steel axles. The Pennsylvania railroad again offers for bids its old rail accumulation of 37,000 to 40,000 tons. A Chicago wrecking company has obtained about 2,000 tons of scrap to be realized by the tearing down of several power houses for the Philadelphia Rapid Transit Co.

Prices Are Weak

New York, June 1.—Some signs of easiness have been developing in this district as related to eastern Pennsylvania buying. Offerings of material have been more liberal and this has had a tendency to depress prices. The situation is well displayed in heavy melting steel for which certain eastern Pennsylvania works which were offering $11.50, delivered, now will pay but $11. This latter seems to be more generally the buyer's price. One eastern Pennsylvania works is credited with having obtained 1,500 tons on this basis.

Heavy Melting Softens

Buffalo, June 1.—The week in the old material market has been devoid of large sales. Heavy melting steel is not so active since the passing of the holidays. The price has softened from $11 to $11.50 down to $10.75 to $11. The principal local user is apparently covered for the time being. There was a sale of about 200 tons of old car wheels at $11.50, and an inquiry for about 500 tons additional is still in the market. The price of $10.75 to $11.25 has stiffened to $11 to $11.50. The general commodities for the week are reported quiet.

Shipments on contract continue to be brisk.

Prices Stiffen

Pittsburgh, June 1. — Moderate improvement is reflected by the market for iron and steel scrap. Consumers of low phosphorous material are paying premium prices, several tonnages having commanded as high as $15. Sellers of this grade are refusing to dispose of material and most producers have been attempting to buy in the open market. Heavy melting steel reflects moderate strength, but not enough new tonnages have been sold to indicate any change in the position of prices.

Shipments Good

Cincinnati, June 1.—Shipments of iron and steel scrap on old contracts are good, but new sales are at a minimum, and the market shows no indication of a revival of buying and selling. Rolling mills in this territory are running full in all departments, and are taking large quantities of heavy melting steel, No. 1 busheling and bundled sheet scrap. Foundries are buying No. 1 cast in small and scattered lots. Prices are unchanged.

Scrap is Apathetic

Chicago, June 1.—Extreme dullness has settled over the market in Chicago and practically no business is being done. Consumers are well supplied and practically no tonnage is moving to mill yards while accumulations in the hands of dealers are increasing.

Rail tonnages continue large and apparently some offerings are retained by roads rather than allowed to pass at the low quotations offered. In some instances, dealers have taken railroad scrap at higher prices than were bid by consumers, taking the chance that an advance later may give a profit. The Chicago & North-Western has just issued a list containing 6,225 tons and the Baltimore & Ohio offers 12,000 tons. The latter list includes 2,000 tons of long steel rails, 1,400 tons of heavy melting steel and 1,000 tons each of No. 1 wrought and steel car wheels. The Chicago & Alton offers 500 tons of long steel rails.

Lifeless at St. Louis

St. Louis, May 29.—The scrap iron and steel markets have been virtually lifeless the past week, and prices remain unchanged. Consumers continue to refrain from purchasing, except where they can pick up a small tonnage at a bargain. A few transactions have taken place between brokers. Railroad offerings for the week are: Chicago & North-Western, 5,250 tons; Nashville, Chattanooga & St. Louis, 4,000 tons; Missouri Pacific, 1,500 tons, of which 500 is for No. 1 railroad wrought, 500 tons No. 2 railroad wrought and 200 tons of cast iron car wheels.

Establish Yards

St. Louis, May 29.—The Hyman-Michaels Co., of Chicago, successor to the Block-Pollak Iron Co., has just established large yards in this city and an office in the city block extending from 5400 to 5500 Bulwer avenue for the handling of scrap.

The yards are on the St. Louis Merchants' Bridge Terminal tracks, affording good shipping facilities. The company began operations on May 15, and in addition to the scrap business, will handle new steel products, such as spikes, bolts, nuts, switches and angle bars.

The buying and selling will be in charge of H. J. Kiener, who formerly was connected with the company in the St. Louis territory. The operating department will be in charge of L. F. Kramer, formerly with the Chicago territory.

The Northwestern Iron Co. of Milwaukee will blow in its second stack at Mayville, Wis., June 5 or 6. This will give the Mayville plant two active stacks.

(*For complete prices see page* 1138.)

Plant Additions

Are Bringing Fair Tonnages to Eastern Mills—Few New Lettings

Philadelphia, June 1.—Eastern Pennsylvania shape makers now are getting the benefit of good tonnages recently placed in eastern territory for the extension of plants manufacturing war munitions so that some of them are 75 per cent active. About 3,000 tons for one New England contract of this kind now are being specified with these mills and about 3,000 tons for the Baldwin Locomotive extensions will go to eastern makers, representing the portion that will be fabricated at Pottstown, Pa. The original tonnage in this contract has been increased somewhat by later additions. A new 2,000-ton letting at Trenton, N. J., will be supplied in the east. The Carnegie Steel Co. will furnish about 4,500 tons of plain material for vessels recently taken by the Cramp and New York ship building yards. All of the tonnages come under old options or current contracts in which the price is considerably below the prevailing figure of 1.20c, Pittsburgh. Such orders as have been going at 1.20c have been chiefly of the smaller class. These have not seemed as plentiful the past week as previously. An inquiry for 600 tons of columns for Washington is out.

New Subway Section

New York, June 1.—A new subway section in Brooklyn requiring 6,400 tons of steel has been offered in the market and other tonnage for the rapid transit lines is expected to follow shortly. About the usual amount of miscellaneous tonnage is coming out, but the small orders predominate. Included in the week's lettings is a 2,700-ton grandstand for a Long Island motordrome. A fair amount of railroad tonnage also was closed. In this city, a number of contracts still are delayed in closing. Some small inquiries for export to Cuba are current. Prices seem substantially unchanged at 1.20c, Pittsburgh, or 1.369c, New York, though this can be shaded on a large tonnage.

Fabricators More Active

Pittsburgh, June 1.—While no large contracts involving structural material have been placed this week, fabricating shops in this district are fairly busy and indications are that even more satisfactory conditions soon will prevail. Numerous inquiries for small tonnages are pending and several contemplated undertakings involve tonnages ranging from 5,000 to 11,000. Structural shapes are being firmly held at 1.20c for second quarter delivery and 1.25c is quoted for the third quarter.

Pending Projects

Cleveland, June 1.—It is expected that the contract for the Goodrich addition at Akron, calling for 1,000 tons, will soon be awarded. Bids are to be received this week. The Osborn Engineering Co., Cleveland, drew the plans. Bids are being received this week at Youngstown on the McKinley Birthplace Memorial, to be erected at Niles. The addition to the Statler hotel is expected to assume more definite shape at an early date.

Structural Demand Light

Chicago, June 1.—Structural lettings in the west the past week have been unusually few and only one item of importance is noted. The University of California has awarded 1,140 tons to the American Bridge Co. for a hospital in San Francisco.

Considerable bridge business is expected to come out the present season, including the East St. Louis approach to the Merchants bridge, involving about 24,000 tons, and the superstructure and approach for the Memphis railroad bridge, about 30,000 tons.

Interference with construction work in Chicago by labor troubles has resulted in a great lessening of demand from that source. Structurals continue to be weaker than steel bars and shading of prices on the small volume of business now moving is the rule.

CONTRACTS AWARDED

Train shed and grade crossing work for the Lehigh Valley railroad at Buffalo, 2,000 tons, placed with the American Bridge Co.

Bridge work for the Chesapeake & Ohio Northern, 2,100 tons, recently placed, now ascertained went to the Virginia Bridge & Iron Works.

Grandstand for the motordrome, Sheepshead Bay, L. I., 2,700 tons, to the Lackawanna Bridge Co.

Extensions to plant of the John A. Roebling & Sons Co., Roebling, N. J., 2,000 tons to McClintic-Marshall Co.

Forge shop and other extensions to plant of Timken-Detroit Co., 400 tons to McClintic-Marshall Co.

Bridge work, Pennsylvania railroad, 750 tons, to the Fort Pitt Bridge Works.

Erie Stove Co., Erie, Pa., plant addition, 200 tons to Pittsburgh Bridge & Iron Co.

Reznor Stove Co., Mercer, Pa., new plant, 400 tons to Pittsburgh-Des Moines Bridge Co.

D. H. Coplon & Co., Buffalo, store and office building, 100 tons to C. F. Ernsts' Sons Co., Buffalo.

University of California, hospital building, San Francisco, 1,140 tons, to American Bridge Co.

CONTRACTS PENDING

St. Marys College, Emmettsburg, Md., 450 tons; bids taken.

Section No. 1 of route 29 of the Eastern Parkway extensions, Brooklyn, 4,600 tons; bids to be received June 15.

Addition for the Goodrich Rubber Co., Akron, O., 1,000 tons. Osborn Engineering Co., Cleveland, engineer.

McKinley Birthplace Memorial, Niles, O., 210 tons. Bids being received this week at Youngstown.

Apartment house, Walnut street, Philadelphia, 400 to 500 tons; bids being taken.

Elks Temple, Pittsburgh, 300 tons.

(*For complete prices see page* 1138.)

Wire Extras Boosted

Pittsburgh, June 1.—Leading manufacturers of wire products today advanced extras for galvanizing 20 cents per 100 pounds, the extra for galvanizing wire now being 80 cents per 100 pounds, as against the previously prevailing extra of 60 cents per 100 pounds. The advance in the price of spelter is responsible for the increase in the differential for galvanizing wire. For galvanizing standard nails, 1-inch and longer, makers now are asking an extra of $1.50, as against the previous extra of $1.30; for galvanizing standard nails under 1-inch, an extra of $2 is provided, as against the previous extra of $1.80. Galvanized wire now is quoted at $2.20 and galvanized barb wire at $2.40. Demand for wire products for foreign shipment continues heavy and a number of attractive contracts have been placed quietly. From a purely domestic standpoint, the market shows no snap and nails continue to be offered on the basis of $1.55 a keg.

Pressed for Delivery

Buffalo, June 1.—Sales and inquiry in the Buffalo district continue light but specifications for material under contract are coming out in steady volume. The mills are being pressed for deliveries on flat wire, wire rope and specialties including bar and screw stock. Some of the interests report that on manufacturers' wire the deliveries are extended to five weeks. This demand is due largely to export orders, it is claimed.

Advanced $4

New York, June 2. (By wire.)—Effective today, the American Steel & Wire Co. advanced the galvanizing extra on wire products $4 a ton. The extra now is 80 cents on base sizes, against 60 cents formerly. The extra has advanced $8 in recent months.

The United States Cast Iron Pipe & Foundry Co. has opened a new office in Kansas City, Mo., at 1404 R. A. Long building, under the charge of R. C. Clifford, formerly of the St. Louis office of this company.

Output of Pig Iron Shows Big Gain

First Time in 21 Months That Gain is Shown Over Corresponding Month of Previous Year—Production Increases 51 Per Cent Since December

THE ABILITY of the pig iron industry of the country to recover rapidly from a period of deep depression is strikingly illustrated by the figures showing the output of coke and anthracite pig iron in May. The production last month was 2,250,556 tons against 2,114,518 tons in April, a gain of 136,038 tons, and the largest total in 13 months.

The feature of greatest interest in connection with these figures is the remarkable recovery made in the last five months, December, 1914, having marked the low point of the decline. Comparing May and December, a gain of 755,000 tons, or 51 per cent, is shown. The rate of production maintained in May would mean a total yearly output of 26,500,000 tons, which compares with an actual production last year of only 23,000,000 tons.

Of almost equal importance is the fact that May showed an increase over the corresponding month of the previous year. This was the first time in 21 months that any month's production exceeded the corresponding month in the year preceding.

There was a net gain of 10 in the number of active furnaces, 207 operating on May 31. This number is the largest since April, 1914. Comparing the active furnaces on May 31 with Nov. 30, 1914, the low point of the period of declining production, a gain of 57 stacks, or 38 per cent, is shown. Six merchant stacks were blown in last month and two were blown out, a net gain of four. Six steel works' furnaces were relighted and none blown out.

The average daily production in May was 72,599 tons, compared with 70,484 tons in April, a gain of 2,115 tons. The average output of the steel works or non-merchant furnaces was 54,836 tons in May against 53,048 tons in April, a gain of 1,788 tons. The merchant furnaces averaged 17,269 tons in May and 17,025 tons in April, a gain last month of 244 tons.

The total production of non-merchant iron in May was 1,699,911 tons against 1,591,426 tons in April, a gain of 108,485 tons. Merchant furnaces produced 535,325 tons in May and 510,755 tons in April, a gain of 24,570 tons.

The production of ferro in May was 6,889 tons against 6,036 tons in April, a gain of 853 tons. The output of spiegel in May was 8,431 tons against 6,301 tons in April, a gain of 2,130 tons.

The merchant furnaces blown in were: Philadelphia, Sloss-Sheffield Steel & Iron Co., May 24; one Iroquois, Iroquois Iron Co.; Blanche, Marting Iron & Steel Co., May 27; Mary, Ohio Iron & Steel Co., May 11 and Buena Vista, Allegheny Ore & Iron Co., May 20. Those blown out were Robesonia, Robesonia Iron Co., May 1; and Allegheny, Allegheny Ore & Iron Co., May 25.

The steel works' furnaces blown in were Ensley No. 1, Tennessee Coal, Iron & Railroad Co., May 3; Gary No. 5, Indiana Steel Co., May 22; one Cambria, Cambria Steel Co., May 27; one Carrie, May 28, and one Isabella, May 21, Carnegie Steel Co. and Monongahela No. 4, National Tube Co., May 1.

Clinton of the Clinton Iron & Steel Co., which was banked Sept. 6, 1914, resumed May 20. Shenango No. 3 of the Shenango Furnace Co., which had been banked for several months, resumed May 18. Hokendauqua No. 1 of the Thomas Iron Co., was banked May 20. Top of the Wheeling Steel & Iron Co., which was banked May 24 for repairs, resumed June 1.

AVERAGE DAILY PRODUCTION.

	1915.	1914.	1913.	1912.
Jan. ...	51,323	60,624	89,929	66,220
Feb. ...	59,521	67,450	92,095	72,372
Mar. ...	66,009	75,534	89,123	77,791
Apr. ...	70,484	75,383	91,812	79,254
May ...	72,599	67,646	90,865	80,753
June ...	.....	63,486	87,229	81,125
July ...	.....	63,075	82,525	77,502
Aug. ...	.....	64,403	81,839	80,650
Sep. ...	.....	62,757	83,137	81,482
Oct. ...	.....	57,007	81,933	86,569
Nov. ...	.....	50,042	74,322	87,985
Dec. ...	.....	48,236	63,746	89,590
Average	64,033	62,934	83,980	80,124

MONTHLY PRODUCTION.

	1915.	1914.	1913.
January	1,591,024	1,879,336	2,787,800
February ...	1,666,592	1,888,607	2,578,670
March	2,046,280	2,341,551	2,762,823
April	2,114,518	2,261,501	2,754,353
May	2,250,556	2,097,019	2,816,825
June	.....	1,904,566	2,616,883
Total 1st half.	.....	12,372,580	16,317,354
July	.....	1,955,324	2,558,275
August	.....	1,996,483	2,537,018
September .	.....	1,882,718	2,494,098
October	.....	1,767,227	2,539,924
November ..	.....	1,501,269	2,229,960
December ..	.....	1,495,325	1,976,138
Total 2d half.	.....	10,598,346	14,335,413
Grand total	9,668,970	22,970,926	30,652,767

MAY PIG IRON.

States.	No. of stacks.	No. in blast last day of month. May.	April.	Total tonnage made. Merchant.	Non-Merchant.	——Totals—— May.	April.
Pennsylvania	157	86	83	129,764	794,530	924,294	864,305
Ohio	73	46	44	106,231	462,860	569,091	548,753
Alabama	45	17	15	113,630	33,775	147,405	139,502
Virginia	22	5	4	21,995	.....	21,995	14,770
New York	26	16	16	75,552	99,431	174,983	156,814
New Jersey	6	1	1	6,612	.....	6,612	6,592
Illinois	26	12	11	19,920	144,411	164,331	150,326
Colorado	6	2	2				
Indiana	10	9	8				
Maryland	4	2	2				
Wisconsin	6	2	2	14,939	160,532	175,471	169,908
Kentucky	7	1	1				
West Virginia	4	1	1				
Tennessee	18	4	4				
Washington	1	0	0	23,046	4,372	27,418	27,706
Georgia	2	0	0				
Texas	3	0	0				
Minnesota	1	1	1				
Michigan	3	2	2				
Missouri	1	0	0	23,636	.....	23,636	23,505
Spiegel—All states...						8,431	6,301
Ferro—All states....						6,889	6,036
Totals	421	207	197	535,325	1,699,911	2,250,556	2,114,518

More Machinery Ordered

New York, June 2.—(By wire.)—The General Electric Co. has ordered several hundred more machine tools for manufacturing shrapnel. The Hall Signal Co., Garwood, N. J., is figuring on a large war contract, and the General Vehicle Co., Long Island City, N. Y., is buying machinery for the manufacture of war munitions.

Rail Orders

New York, June 2. (By wire.)—The Norfolk & Western has placed 5,100 tons of rails with the Carnegie Steel Co. The Chicago & Alton has ordered 3,000 tons additional from the Illinois Steel Co., and the Louisville, Henderson & St. Louis 3,000 tons of the same maker.

British Prices Advance

Higher Quotations on Pig Iron and Finished Materials —Belgian Billets Imported Into Sheffield

Office of *The Iron Trade Review*,
Prince's Chambers, Corporation St.,
Birmingham, Eng., May 24.

There has been a little temporary hardening of pig iron prices during the past week, but the present outlook is indicative of decline. There has been a good deal of irregularity in Cleveland iron, quotations varying as much as 2s (48 cents) per ton. Buying in that district is restricted to small parcels for prompt delivery. The makers are in a strong position, having their books well furnished and are content to await developments. Some little relaxation has been secured of the government prohibition of exports of foundry iron, so that special permits are obtainable. Cleveland warrants are now quoted at 63s 3d ($15.08). Shipments for the month so far total 5,700 tons, an insignificant total, while warrant stocks have increased 4,000 tons. The east coast hematite trade is just now showing a slight downward tendency, the fall on the week being equal to half a crown (60 cents). The makers are asking 102s 6d ($24.60).

A series of most important advances have taken place within the past week in finished iron and steel. The South Yorkshire Bar Iron Association a week ago decided to advance the basis price of crown bars 15s ($3.60) per ton, making the figure £10 10s ($50.40) per ton, delivered, less 2½ per cent discount. In the Staffordshire district, a further advance took place two days ago in the price of best bars, commonly called marked. This raised the basis price for marked iron to £11 ($52.80), with the usual 12s 6d ($3) for special brands. This makes the fourth advance this year, and it is 15 years since best bars last touched £11 ($52.80). During the boom of 1912, the highest price reached was £10 ($48). The great moderation of this advance shows how steadily the makers of best iron are maintaining their conservative policy. They are even now scarcely keeping pace with the rapid rise in common iron. Several advances have taken place in common bars and gas strip, which are quoted £10 5s ($49.20), delivered in Birmingham. It was reported on Thursday that a sale of common bars had been effected at £10 10s ($50.40) so that at that time common bars had reached the marked bar level. In face of this the best bar houses were forced to take action in putting up their prices. Lancashire and North Staffordshire crown bars are both quoted at £10 10s ($50.40) and are likely to further advance.

In the finished bar works, there is a great congestion of business and for prompt delivery makers can practically obtain their own prices.

The steadiness of steel prices in view of the huge government demand is a very significant fact and may be interpreted as a tribute to American enterprise in sending steel to this country. Finished steel advanced 10s ($2.40) a few days ago, making the basis for joists £9 10s ($45.60), as compared with £9 7s 6d ($45) for angles. The fact is that every week more and more American steel, both of the finished and unfinished description, is coming through. But there is still great scarcity and we are looking forward to getting more when shipping and dock facilities improve. In Sheffield, bessemer acid billets are realizing £10 15s ($51.60) and £11 ($52.80). A most singular development has been the importation of Belgian billets as well as of hoop iron into Sheffield. Apparently the material was sent out of Belgium by German permission to Dutch agents. Whether the Germans were aware of its ultimate destination is not very clear. The hoop iron was very welcome, because it was especially punched and packed on reels ready for use. In this respect, apparently, British makers have not been quite so successful in meeting the wants of British consumers. In view of the exceptional conditions, this arrival of Belgian material is regarded as a kind of curiosity and viewed with as much interest as Mr. Greiner's successful production of steel at Seraing by means of tar as a substitute for coal.

The enormous demand for steel has given a good inning to steel scrap which is realizing £5 ($24) per ton for good qualities.

American Steel & Wire Changes

Chester A. Orr, superintendent of the Central blast furnaces of the American Steel & Wire Co., Cleveland, has tendered his resignation, effective June 1, to become manager of the Cleveland Metal Products Co., a subsidiary of the Cleveland Foundry Co. The Cleveland Metal Products Co. recently has begun the rolling of aluminum on an extensive scale. B. E. Pheneger, superintendent of the Donora furnaces of the American Steel & Wire Co., will be transferred to Cleveland to fill the vacancy caused by Mr. Orr's resignation. Charles J. Brown, superintendent of the Schoenberger blast furnace plant, will be transferred to Donora, and John C. Hopkins, superintendent of the Emma blast furnace, Cleveland, will become superintendent of the Schoenberger plant. Mr. Orr has been connected with the Central plant since 1907. He is a graduate of Case School of Applied Science, as are also Mr. Brown and Mr. Pheneger.

Ferro is Quiet

With a Few Sales Being Made at the Advanced Price

New York, June 1.—Though some negotiations are going on and a few sales have been made at the advanced price, conditions in the ferro-manganese market are quiet. The price continues $100, seaboard, for such delivery as the sellers can make, but the English producers remain in their attitude of not desiring to take much additional business while their sources of ore supply are uncertain. These makers still are requiring that all offers be submitted for their final consideration. The price of spot ferro-manganese still is a matter of doubt in the absence of sales. The last sales of carloads were made at $100, seaboard.

Another arrival of 700 tons has come in at Baltimore and it is expected that some further tonnage will come in the latter half of June representing May quotas upon which licenses recently were granted.

Some St. Louis Sales

St. Louis, May 29.—The selling of ferro-manganese has begun in this market, and several lots were disposed of in the middle of the week on a basis of $100, seaboard, compared to $88 on May 1. This is an advance of $12 a ton.

The annual meeting and banquet of the Detroit Foundrymen's Association was held at the Hotel Tuller recently. Officers for the ensuing year were elected as follows: President, A. F. S. Blackwood, Michigan Steel Casting Co.; vice president, Robert B. Carolin, R. B. Carolin Co.; secretary, William A. Fletcher, American Blower Co., and treasurer, E. I. Chase, Cadillac Motor Car Co.

Spelter Market Excited

And Consumers Are Willing to Pay Very High Prices —Other Non-Ferrous Metals Advance

New York, June 1.—Practically all the non-ferrous metals have advanced during the week. The spelter market has reflected continued excitement with a demand for which the supply is not at all adequate. The interesting feature is that consumers are more and more willing to pay any price asked and to take any delivery in any quantity offered. This is especially true of the mills which are manufacturing war munitions. These interests are desirous of booking their spelter requirements as far ahead as possible. The brass mills now are by far the largest buyers of spelter and their requirements of the metal are in many cases at least four times the normal. These interests, owing to their inability to get brass special, are buying prime western heavily. It is doubtful whether prime western for June delivery now could be bought for less than 23c, St. Louis. Futures, for delivery over the next three or four months, are held at no less than 21c to 22c, depending on the position. Brass special is quotable at about 24c to 25c. Sheet zinc was advanced this morning to 24.50c, and talk now is heard of 26c.

Next to spelter, lead is the most interesting metal. The price of lead has been advanced rapidly during the week and now is 4.90c, New York. Producers say they are receiving the biggest volume of inquiry on record. There are not many free sellers, however, since it is expected prices shortly will go even higher.

In aluminum, the supply is very meager. This is because the domestic producer has had to take care of almost the entire demand since very little of the metal has been imported lately. The domestic producer is sold up several months ahead and, consequently, second hands are able to realize heavy premiums. These interests are asking 28c and 30c on five and ten-ton lots.

The copper market is quiet and practically unchanged. First-hand prices are 19c, delivered 30 days, on electrolytic; 18.25c to 18.50c, delivered 30 days, on best casting; 19c, cash, on prime lake; 18.75c to 18.87½c, cash, on arsenical lake and 23c to 24c, cash, on the best lake brands. Second sellers offer to shade these prices on small tonnages. Casting copper not made from virgin material is held at about 17c, cash.

The antimony market is quiet with Chinese and Japanese spot nominal at 35c to 36c. Offers on futures have been somewhat more plentiful.

There has been a lively inquiry for tin during the week but few actual transactions. The market today is quiet but some activity is looked for shortly. Spot is held at 38c; June at 37.80c; July at 37.60c; August and early September at 37c; late September at 36.50c, etc.

Forty Millions

Could Easily Be Exceeded at May Rate of Ore Shipments

Ore shipments during May were 5,012,359 as against 3,852,063 tons for May of last year, an increase of 1,160,296. The movement to June 1 was 5,516,191 tons as against 4,121,749 tons to June 1, 1914. This is a fair gain and if the proportion is continued throughout the season, the total movement will be easily in excess of 40,000,000 tons. The movement during May would really have been greater than it was were it not for the cut in the rail rate made effective June 15 by the interstate commerce commission. The railways have voluntarily made the rate effective June 1 so that a better movement from the Mesabi range may now be expected.

Following are the shipments by ports with corresponding data for last year:

Port.	May, 1914.	May, 1915.
Escanaba	385,188	479,259
Marquette	121,873	178,927
Ashland	300,928	513,715
Superior	1,673,269	763,889
Duluth	734,090	1,974,321
Two Harbors	636,715	1,102,248
	3,852,063	5,012,359
1915 increase	1,160,296	

Port.	To June 1, 1914.	To June 1, 1915.
Escanaba	495,917	528,566
Marquette	121,873	183,365
Ashland	341,766	557,664
Superior	1,735,607	851,064
Duluth	734,090	2,149,310
Two Harbors	692,496	1,246,222
	4,121,749	5,516,191
1915 increase	1,394,442	.....

So far the bulk of the ore has been moved by vessels operated by shippers and wild cargoes have been few. Chartering of outside tonnage will undoubtedly begin during the present month, however, and with fair activity in the iron trade the vessels can expect to enjoy a reasonably active season.

The double holiday did not affect the trade at all. There was practically no congestion at Lake Erie ports, all vessels being unloaded promptly.

Death of Edwin Miles, Nonagenarian

Edwin Miles, pioneer iron and steel manufacturer, and one of the oldest members of the trade, died at his home in Pittsburgh, May 25. He was 97 years old. Mr. Miles was born in Montgomery county, Pa., near Valley Forge. When he was 19 years old, he became a country school teacher. Later, he went to Huntingdon, where he became a clerk in the plant of the J. H. & George Schoenberger Iron Co.

In 1846, he went to Pittsburgh and again became identified with the Schoenberger interests and eventually became a partner in that concern. Sixteen years later, he became interested in the Black Diamond Steel Works, and was identified with that interest until 1866. In 1869, Mr. Miles became a partner in the Duquesne Iron & Steel Co. Some years later, he became a member of the firm of Everson, Grass & Macrum and remained with that firm until its dissolution in 1892, when he retired from active business. Mr. Miles was said to be the oldest Mason in Pennsylvania.

Death of Chas. W. Seamans

Charles W. Seamans, president of the Remington Typewriter Co., died at his home at Cape Ann, Mass., May 30, where he had been brought a few days earlier in the hope of benefiting his health. He did more to popularize the use of the typewriter in its earlier days than any other man and his success caused his advance from sales agent to president of the Remington company. He was born in Ilion, N. Y., June 5, 1854. He began his working years in the employ of E. Remington & Sons, arms manufacturers in that city. Later he became manager of the typewriter department of the company. In 1862 he organized the firm of Wychoff, Seamans & Co., which later became the Remington Typewriter Co. He was a resident of Brooklyn.

All But One

Chicago, June 1.—The Gary plant of the Illinois Steel Co. now is operating seven of its eight blast furnaces. The seventh furnace was blown in the last week in May and brings the operation of the plant almost to full operation. Open hearth capacity in keeping with blast furnace volume is now active and both the rail and merchant mills are operating at a heavier rate than previously.

Money and Iron: Fact and Comment

Effect of the War on Sales of the International Harvester Co.—Sluggish Week in Industrial Stocks

The International Harvester Corporation of New Jersey reports net profits of 13.41 per cent for the year ended Dec. 31, 1914, on the $40,000,000 common stock, as compared with 14.54 per cent for 1913.

The International Harvester Corporation, having charge of the foreign business, fared not so well. It showed net earnings on common of 5.40 per cent, as compared with 12.64 per cent for 1913. This was due to conditions wrought by the war. The last two quarterly dividends were suspended, making only 2½ per cent paid on the common shares for the year. Earnings of the two Harvester companies for 1914 and 1913 compare as follows:

INTER-HARVESTER OF N. J.

	1913.	1914.
Gross profits	$13,284,671	$12,206,227
Net profits	7,915,526	7,463,231
Dividends	4,100,000	4,100,000
Surplus	3,815,526	3,363,231
Total surplus	19,608,798	22,972,029
Per cent on common	14.54	13.41

INTER-HARVESTER CORPORATION.

	1913.	1914.
Gross profits	$10,356,628	$7,329,825
Net profits	7,155,253	4,262,594
Pfd. div.	2,100,000	2,100,000
Com. div.	2,000,000	1,000,000
Surplus	3,055,253	1,162,594
Total surplus	18,848,525	20,011,119
Per cent on common	12.64	5.40

Industrial Stocks

More industrial stocks reported losses than gains last week, but the changes were not of great importance. There was a strong opening Monday and it looked as though there might be a return to April activity, but dullness soon set in and many stocks suffered a relapse after the opening advance. The market was sluggish Tuesday, and Bethlehem Steel lost a point; Crucible lost 2⅜ points. Directors of the Republic Iron & Steel Co. met but did not order a resumption of the preferred dividend, which was passed last summer. The news of the disaster to the American steamship Nebraskan had a depressing effect Wednesday and further declines were recorded. The market Thursday was a professional one and the prevailing sentiment was more cheerful. There was considerable buying of Steel common. The market was inactive Friday. Considerable firmness was shown at the short session Saturday, but there were no important developments and the market was closed until Tuesday. Quotations at the close of business May 29 and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close May 29.	Net change.
Amer. Brake Shoe & Fdy. Co., ctfs.	100½	— ½
Amer. Brake Shoe & Fdy. Co., ctfs., prfd.	149	.....
American Can	36¾	+ ⅞
American Can, prfd.	97	+1¼
Amer. Car & Foundry Co.	51½	— 1½
Amer. Car & Fdry. Co., prfd.	110½	—1½
American Locomotive	46	—2
American Locomotive, prfd.	.....	.....
American Steel Foundries	.....	.....
Baldwin Locomotive	48	—1½
Baldwin Locomotive, prfd.	101¼	+1¼
Bethlehem Steel	137	—5½
Bethlehem Steel, prfd.	112	+1
Colorado Fuel & Iron	30	+2½
Continental Can	58½	.....
Continental Can, prfd.	.....	.....
General Electric	152	—1½
International Harv. of N. J.	94⅞	+ ⅜
Inter. Harv. of N. J., prfd.	109¾	—2½
Inter. Harv. Corp.	65	+5
Inter. Harv. Corp., prfd.	.....	.....
Nat'l Enamel'g & Stamp. Co.	15⅜	— ⅛
Nat'l Enam. & Stmp. Co., prfd.	82	—3
Pressed Steel Car	44½	—1
Pressed Steel Car, prfd.	95	— ⅛
Pullman Palace Car	155	+1¾
Republic Iron & Steel Co.	27¾	— ¼
Republic I & S. Co., prfd.	83½	—2¾
U. S. Cast Iron Pipe & Fdy.	14½	—2⅞
U. S. C. I. Pipe & Fdy., prfd.	44	—1⅞
United States Steel	54¾	— ¼
United States Steel, prfd.	106⅝	+ ⅝
Westinghouse Mfg.	93	—2

New Furnace Company

Another chapter is about to open in the history of the Lake Superior Iron & Chemical Co., which has been in the hands of a receiver since Oct. 30, 1913. Plans for the re-organization have been worked out in detail under the direction of Frank W. Blair, president of the Union Trust Co., Detroit, and now are near completion. Mr. Blair formerly was chairman of the Lake Superior company's board of directors, and since has acted as receiver. Articles of incorporation for the reorganized company have been filed in Wayne county, Mich. The company will be known as the Charcoal Iron Co. of America, and will have a capital stock of $7,989,600, comprising $5,183,750 of 6 per cent cumulative preferred stock and $2,805,850 of common.

The incorporators, who also constitute the re-organization committee, which is prepared to purchase the assets of Lake Superior Iron & Chemical Co., when they are offered for sale in Marquette in the foreclosure proceedings, probably about July 1, comprise: John W. Mitchell, Toronto; Frank W. Blair, Henry H. Bingham, Frank W. Hutchings, Henry M. Campbell and Harry Slater, all of Detroit, and George J. Webster, Marquette. The new company has elected officers as follows: President, Frank W. Blair; vice president, John W. Mitchell; treasurer, Frank W. Hutchings; secretary, Henry H. Bingham; general manager, George J. Webster.

Knocked Out

Is Suit to Restrain Shipments of Munitions to Europe

Judge W. J. Turner of the state circuit court at Milwaukee, Wis., handed down a decision May 29 dismissing the suit brought by "General" Samuel Pearson under the "discovery" statute of Wisconsin against the Allis-Chalmers Mfg. Co. and General Otto Falk, its president. The purpose of the suit was to force General Falk to bring into court under the "discovery" statute all papers and contracts between his company and the Bethlehem Steel Co. bearing on the manufacture of shrapnel shells presumably for use by the allies in the European war.

Mr. Pearson brought suit as an American citizen with property interests and investments in Germany and sought damages from the Allis-Chalmers Mfg. Co. through the claim it was doing harm by assisting in furnishing munitions of war to the enemies of Germany.

The decision permanently enjoins examination of General Falk under the "discovery" statute and dismisses the suit brought by Mr. Pearson. The decision covers 26 typewritten pages and cites many authorities and quotes at length from the proclamation of President Wilson and from treaties with the belligerent nations.

Steel for St. Louis Bridge

St. Louis, June 2. (By wire.)—The board of public service requests bids on 24,000 tons of steel to complete the East St. Louis approach to the municipal free bridge, to cost approximately $1,000,000. Bids are to be opened at noon, June 29, in the city hall. Also bids on cast iron coated water piping, special casings, valves and hydrants for water plants to cost approximately $100,000, are to be opened June 22.

How to Sell Tools to the Government

Interesting Details Regarding the Machinery Purchases of the United States With Pointers on How to Get the Business

BY L. W. MOFFETT

MILLIONS of dollars are spent annually by the United States government for machinery and machine tools. Just how many millions and the manner of their division between miscellaneous machines and tools is a question which Uncle Sam himself could not answer without carefully going through thousands upon thousands of vouchers. There are, however, different departments which can lay their fingers on these details, but as a general thing such information would serve no especial purpose, and, as it would involve much labor and expense, it is not kept in classified form.

The outstanding fact is, however, that the government is a big buyer of machinery, and, while an exacting customer, at the same time it pays its bills surely and promptly. Moreover, a contract fulfilled for the government, with every obligation complied with, is a good recommendation for the contractor. Complaint is often made that too much red tape is involved in dealing with the government, and no doubt instances prevail where justification exists for the protest, but at the same time the government is of necessity conducted on lines different from those applicable to a private industry; its constituency is the 100,000,000 people of the country and they are supposed to be taken into consideration when contracts are made.

Various administrations have been properly indicted for buying material from abroad—and sometimes it was woefully bad material at that—but, with all these mistakes and the objections made to the methods of buying, eagerness is shown by thousands of manufacturers in this country to obtain contracts with the government and thereby draw money from its ample purse.

There are, however, many manufacturers who do not trade with the government but would do so if they were better acquainted with the manner of opening up negotiations; if in other words, they were aware of the method of submitting specifications and bids. Included among this list of manufacturers are those who make machinery and machine tools used by the government. There are still others whose failure to attempt such negotiations, is partly due to the dread of what they consider excessive red tape. An explanation of these methods, given as briefly as possible, might clear up some of the confusion and show that even if there is red tape, the game may be worth the candle and the perplexities not so numerous as may be thought.

Out of his vast business, there are four departments operated by Uncle Sam which buy heavily of machinery and machine tools. They are the navy, the war and interior departments and the Panama canal. The principal buyer in the navy department is the bureau of supplies and accounts. For the fiscal year ended June 30, 1914, its purchases of machinery and machine tools, such as lathes, milling machines, and universal cutters, amounted to $634,079. In the war department are four divisions which buy machinery and machine tools, the engineering department, the bureau of ordnance, the quartermaster department and the signal corps.

Upon recommendation of the paymaster general of the navy, the secretary of the navy has issued an order authorizing the award of contracts for naval supplies in certain cases without referring the bids to the department. In general, contracts amounting to less than $1,000 will not require departmental action, although certain exceptions are made to cover special articles or classes of supplies. This plan is adopted to avoid delays such as frequently have occurred and will do away with the trouble and expense to which bidders have been put on account of the time required for departmental action on bureau

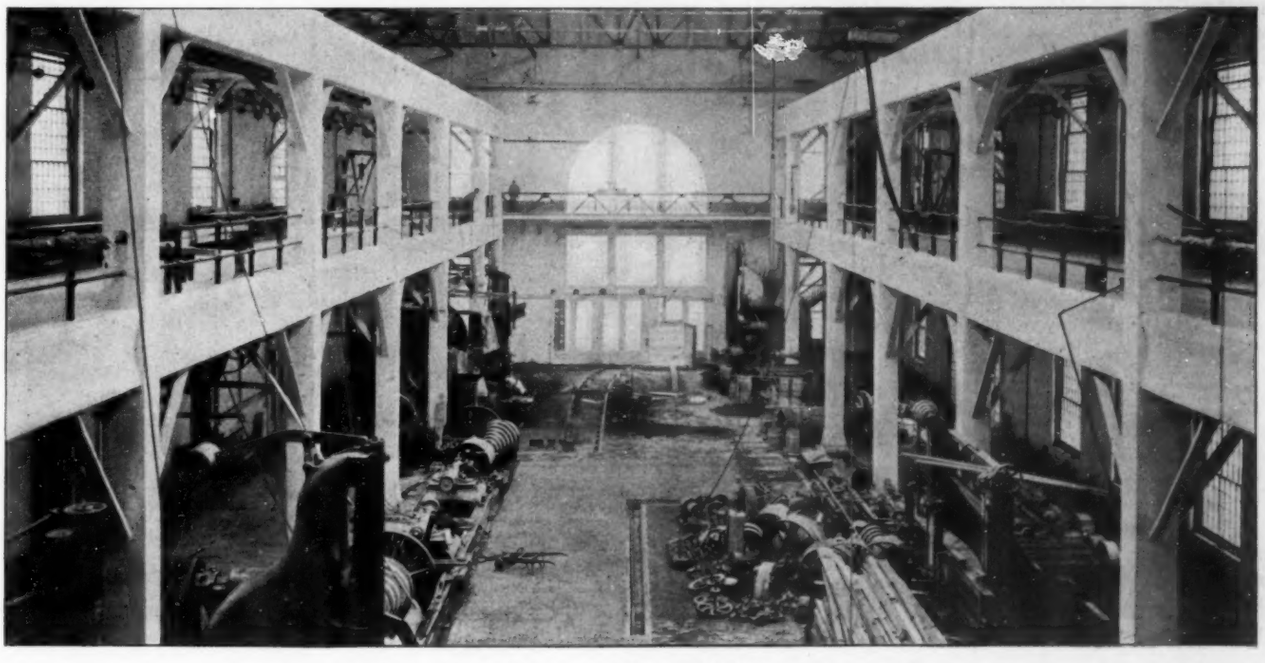


FIG. 1—MACHINE SHOP NO. 1, BOSTON NAVY YARD

recommendations concerning awards of contracts. Moreover, there have been instances where delays have resulted in loss to the government by reason of increase in prices between the date of bids and the date of award of contract. Further, during these periods of delay, certified checks submitted with proposals have been retained by the department, with the result that in many cases bidders have been unnecessarily embarrassed.

The purchases of the engineering department of the army consist of lock and dam and power house equipment and tools, mounting into the millions yearly; the ordnance department spends about $125,000 each year for machinery and machine tools, and quartermaster corps spent $97,578 for the fiscal year ended June 30, 1914, and the signal corps spends approximately $50,000 annually.

The purchases of the quartermaster corps for the last fiscal year included the following:

Electrical machinery and equipment..	$22,355
Laundry machinery	14,867
Fire apparatus, equipment and tools..	22,784
Bake ovens, dough mixers, etc.....	8,487
Pumping plant equipment.....	26,528
Tools, miscellaneous	1,123
Ice plants and refrigerating machy...	1,332

The purchases of the signal corps include electrical radio apparatus, small generators and dynamos to furnish telephone current; gasoline engines for power purposes and tools needed in connection with the service.

Tremendous Purchases by Interior Department

The interior department buys a great variety of machinery and machine tools for work in connection with reclamation projects and for other purposes. The principal items in the list of machinery and machine tools purchased by the interior department during the fiscal year 1914 are as follows:

Three hundred and seven drills; 134 dozen hack saw blades, 10 sets of drills, one band saw machine, one Armstrong tool, one set of screw plates, five vises, eight emery wheels, milling machine with gear cutting attachment, screw cutting lathe, Williams pipe machine, gear wheels for lathes, drill grinder, pattern makers' lathe, one centering tool, one caliper square, chisels, squaring shears, one plunger pump, one drilling machine, shaft hangers, two tap reamers, a boiler and stoker, a pipe cutting machine, two lathe chucks, one set of dies, one gear cutting attachment, a bolt cutter and nut tapper, one grinding machine, 74 cutters, one motor-generator, two threading devices, an engine and generator and two motors.

The Panama canal, which has spent millions upon millions for machinery and machine tools, necessarily is not buying as heavily now that the greater part of this construction work is done.

Among the big purchases, from July 1, 1904, to Jan. 1, 1913, in addition to thousands of cars and hundreds of locomotives, were 101 steam shovels, 61 5-foot gage cranes, 14 pile drivers, three 5-foot gage swing pile drivers, ten track shifters, 26 spreaders, a ballast spreader and grader, 213 well or churn drills, 564 rock tripod drills, 59 pneumatic air rock drills, 26 rock channelers, 23 clam shell excavating buckets, 35 orange peel excavating buckets, 61 barges, two stiff-leg floating derricks, 12 dredges, one drill barge, 28 launches, motor boats and cutters, two floating pile drivers, one floating rock breaker, four steamships, ten tugboats, cranes, etc., for the Gatun handling plant, engines, etc., for rock crushing plants, 63 concrete mixers, 55 boiler feed pumps, 28 centrifugal pumps, seven dredging pumps, 57 duplex piston pumps, along with rolling stock and floating equipment taken over from the French. Aside from the latter, all of the canal equipment mentioned above was purchased from American manufacturers, with the exception of one item, a dredge, which was purchased on March 17, 1910, for $399,340 from William Simons & Co., Ltd., Renfrew, Scotland.

Again Those German Cranes

This dredge and two great floating cranes are the only items of any consequence which have been bought for the canal from foreign makers. The two cranes are of unhappy memory, and were bought from a German builder. One failed to stand the test and the other has not been tested. Both fell far short of specifications. It has been stated in this connection that two cranes of the same kind were previously made by the same company and when tested in Germany failed to perform the service required of them. And this alleged failure is said to have taken place before this government contracted for the two German cranes for the Panama canal.

Recently President Wilson took the last step preliminary to the commencement of construction on the government railroad system in Alaska. Thus a new market is opened for makers of machinery and machine tools. The Alaskan Engineering Commission is to have charge of the building of the two lines. The work, however, will be done by contract in sections, instead of directly by the government. The commission is composed of William C. Edes, chairman; Lieut. Frederick Mears, and Thomas Riggs Jr. C. E. Dole, chief clerk of the purchasing department of the Panama canal, has been named as purchasing agent for the Alaskan commission, which will have general offices in Seattle, Wash. Only small quantities of machinery and tools are being bought at present, but larger purchases will be made in the near future.

The President designated that the Alaska Northern railroad shall be bought and then extended up the Susitna valley to Fairbanks. This will make a total of 471 miles of road from tidewater at Resurrection Bay to Fairbanks. A branch 38 miles long will extend into the Matanuska coal field, which has been shown by careful tests to contain a high grade semi-anthracite coal suitable for use by the navy. The railroad system will tap the two greatest undeveloped coal fields in Alaska, so far as is now known, and a year hence it is expected the mines will be ready for commercial operations.

The Alaskan commission is authorized to take over equipment not needed on the Panama canal, but it is evident much equipment at the latter point cannot be furnished for a long time and in consequence the commission will have to go into the open market for much of its machinery. Inquiry was recently made by Lieut. Mears from Seattle if the Panama canal could transfer to the commission a French ladder dredge with its attendant tugs and barges, together with four locomotives, four locomotive cranes, 60 12-yard dump cars, two steam shovels and two pile drivers complete. The reply was that the material other than the dredge, tugs, barges and locomotive cranes could be supplied, but none of the former could be spared for several months.

Easy to Get Inquiries

Machinery and machine tools are purchased by each department according to its own convenience and methods.

The bureau of supplies and accounts of the navy department has a regular mailing list, to which it sends printed notices of proposed purchases, and any who desire to be added to this list and obtain the mailing card regularly may do so by advising the bureau in Washington. The card announces when the bids will be opened and the material wanted. Bidders who are interested are requested to fill out the application, which is attached, giving the schedule numbers desired, and forward it to the bureau immediately. The applications will be filled as soon as the schedules (circulars giving detailed information) are received from the public printer. Schedules can also be obtained upon application to the navy pay office nearest each navy yard. Bids involving less than $500 may be accompanied by guaranties or a bond but when over that amount a certified check is required with each bid. The mailing cards call attention to the need of stamp taxes required on all bonds and guaranties, a requisite which relates to all departments, of course, where bonds and guaranties are accepted.

Bids for army ordnance supplies are

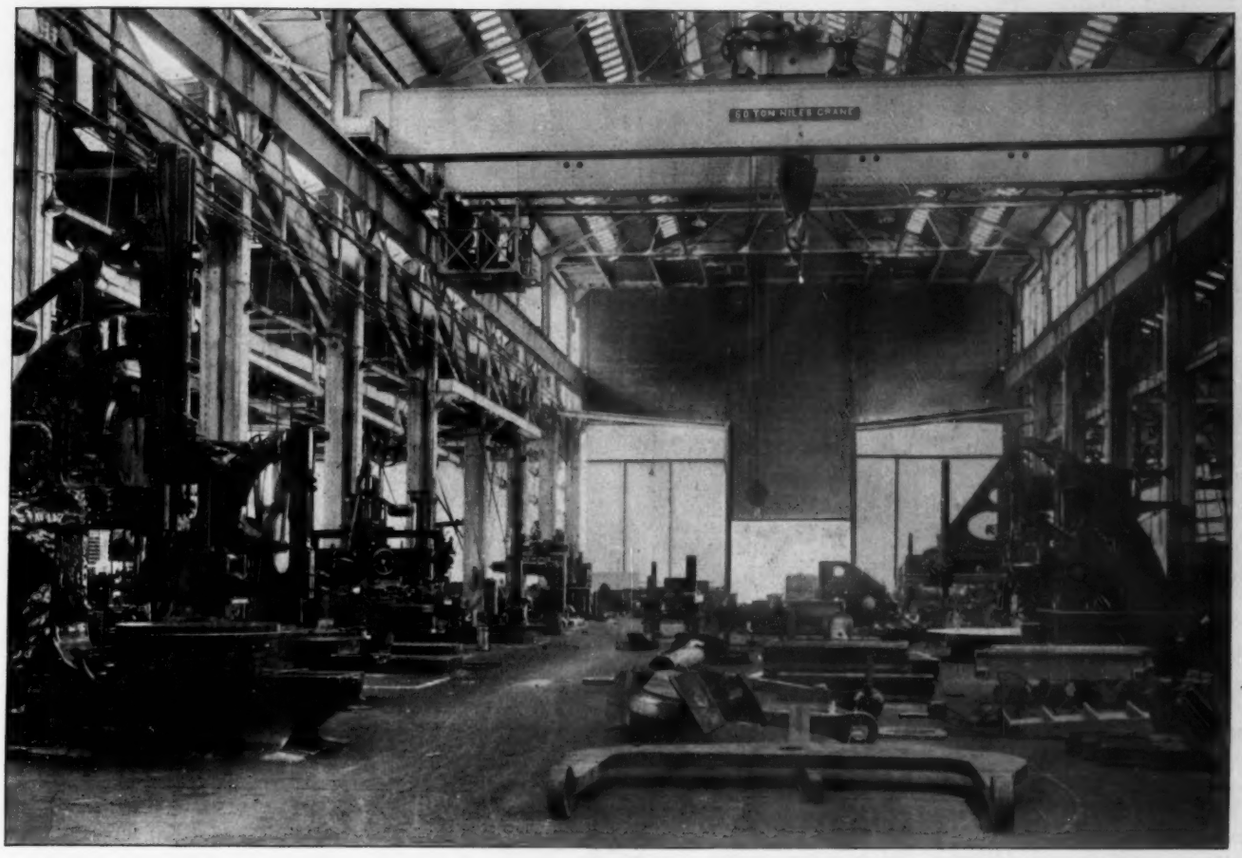


FIG. 2—MACHINE SHOP AT PANAMA CANAL SHOWING A SMALL PORTION OF THE VAST QUANTITY OF MACHINERY PURCHASED BY THE GOVERNMENT

FIG. 3—ANOTHER VIEW IN A MACHINE SHOP AT PANAMA

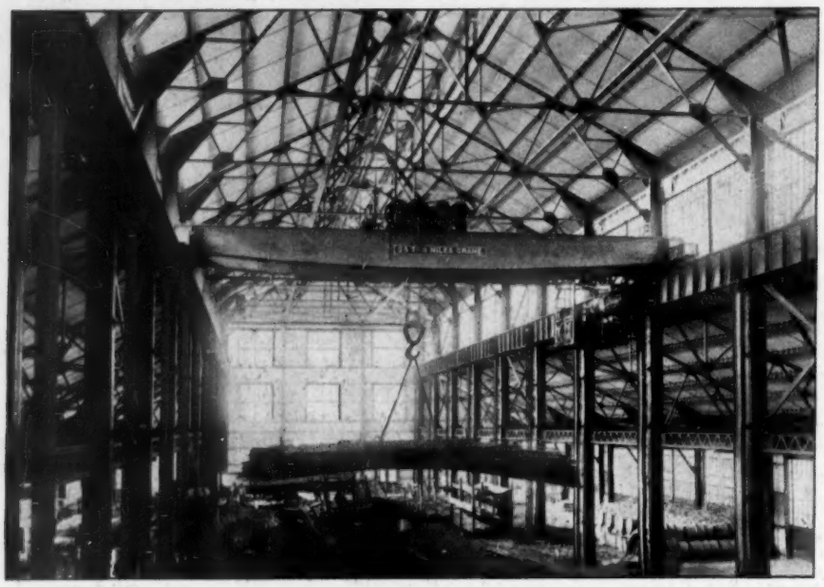


FIG. 4—AMERICAN CRANE AND AMERICAN STEEL IN MACHINE SHOP AT PEARL HARBOR, HAWAII

opened at the arsenals and the purchases of machinery and machine tools include everything from a boring mill to an air hammer. No guaranty, bond or certified check is required ordinarily. Where exceptions are made the bidders will be advised upon inquiry directed to the arsenal to which the bid is to be submitted.

Bids for the engineering department of the army are opened at the respective river and harbor district headquarters throughout the country, but the awards are approved in Washington.

Bidders submitting tenders to the quartermaster corps of the army, after complying with formal instructions, may furnish either a certified check or a guaranty, which may accompany a bid of any amount. The quartermaster corps has now worked out a plan to issue bids for army supplies from Washington, and will hereafter open them and make the awards at Washington. Heretofore, each depot of the quartermaster corps did its own advertising for its respective district, and opened the bids.

The new regulations issued by the United States quartermaster general relating to methods of bidding on army contracts have caused manufacturers and merchants to make protests. The letter of explanation issued by the quartermaster general did not alter the position of bidders, who are said to be considering the question of withholding all further bids unless old regulations are restored. The objection against the new form is directed at the indefiniteness as to the quantity desired. The quartermaster's department retains the privilege of regulating the quantity of goods called for, and manufacturers say this makes it impossible to submit bids for furnishing the goods, with any degree of safety. If the government should take much less than the quantity called for, the cost of preparations and the money laid out for raw material, with which to make the products originally called for, would have to be borne by the maker. Thus, it is contended by bidders, there is nothing on which to count, or base bids submitted. In a circular letter issued by R. M. Schofield, lieutenant colonel, quartermaster corps, United States army, Washington, reply is made to many protests, in which it is stated that it is not the policy of the quartermaster's corps to take undue advantage of the contractor.

Under the old form of regulation the government agreed to take a certain amount of goods, and reserved the right to increase this original amount, within reason, if so desired.

Practically all of the purchasing of the signal corps of the army is handled from Washington. The signal corps does not require any sort of security, aside from exceptional cases, until the award is made. All construction contracts require a bond equal to 50 per cent of the contract. When the amount exceeds $5,000 and the time of delivery is 60 days a 10 per cent bond is required, or a certified check is necessary. But neither is accepted where there is a patent right involved.

The department of the interior buys machinery and machine tools in two ways:

First.—From the general supply schedule. This schedule is made up yearly by the general supply committee, and embraces nearly all classes of supplies that are used by the government, and all the executive departments and independent establishments purchase all the supplies that are needed from this schedule.

Second.—When an article is not on this schedule, purchase is made in open market in the following manner: After due advertising, bids are asked and opened, and an award is made. The successful bidder, after entering into a contract and furnishing a satisfactory bond, is given an order for the supplies.

Sealed proposals in triplicate, are received at the office of the general purchasing officer of the Panama canal, Washington. "Bids must be accompanied by a guaranty bond of good security in a form attached to the circulars issued by the purchasing officer, or by certified check on, or certificate of

FIG. 5—A FLOATING CRANE AT PEARL HARBOR, HAWAII—THIS ONE WAS MADE IN AMERICA

deposit in, a bank or trust company of the United States acceptable to the Panama canal, and made payable to the order of the disbursing clerk thereof, in an amount not less than 15 per cent of the bid." Bidders who prefer to do so may qualify by executing and filing with the Panama canal an annual bond in a form that will be supplied by the general purchasing officer upon application. Owing to the large amounts involved, bidders are advised to be sure that any annual bond which may be on file should fully cover the requirements.

If the bidder proposes to furnish articles or materials of foreign production or manufacture, or articles of domestic manufacture made up, in whole or in part, of imported ingredients or components, he should so state in his proposal. If the bidder fails to give this information in his proposal, the Panama canal may require him to furnish articles of domestic production and manufacture, or it may permit him to furnish articles of domestic manufacture made up, in whole or in part, of imported ingredients or components if all duty has been paid thereon, or it will require that the duty be paid on articles manufactured in bond, and will reserve the right to claim any and all benefits of drawback.

The Panama canal inspectors are to be allowed access to the works of the manufacturer at any or all times during the process of manufacture and at any time, the Panama canal may call on any contractor for copies of orders placed by the contractor with his sub-contractors or in his shops, and it reserves the right to increase or reduce by 20 per cent the quantities specified at any time before manufacture has begun.

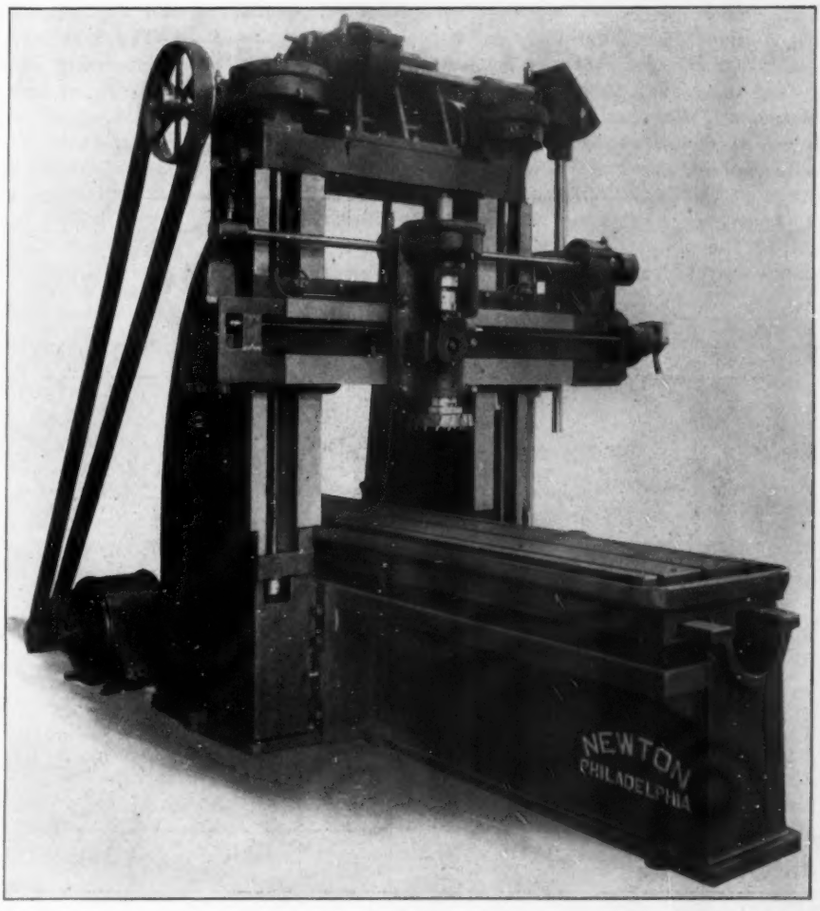
Book on Welding

The Vulcan Process Co., Minneapolis, Minn., has published the third edition of a text book entitled "Oxy-Acetylene Welding and Cutting." The book contains 64 illustrations. The book is designed to furnish mechanics and autogenous welders with practical instruction in oxy-acetylene welding. The subject is discussed in an elementary manner and the book will prove of value to a practical man who desires a thorough working knowledge of the subject. Sixteen tables are published giving data of considerable value to welders.

Vertical Slabbing Machine

A VERTICAL slabbing machine arranged for single-pulley drive, as shown in the accompanying illustration, has been brought out recently by the Newton Machine Tool Works, Inc., Philadelphia. Nine speed changes, ranging from 16½ to 99 revolutions per minute, are obtained through a gear box. The machine will admit work 34 inches wide and has a maximum clearance of 36 inches under the spindle. The vertical spindle is driven by a bronze worm wheel and steel worm fitted with roller thrust bearings which run in oil. The spindle has reversing cross feed on the rail, giving 12 changes and reversing fast power traverse. The diameter of the spindle in the driving sleeve is 3⅛ inches. It has a No. 6 Morse taper in the end with a broad face key for driving cutters. The spline shaft bushings carry auxiliary bushings which rotate with the shaft. These bushings are designed to prevent the escape of oil and preserve the fixed bushing from wear. The spindle sleeve is adjustable through a hand-controlled rack and pinion.

The table has 12 feeds ranging from 0.355 inch to 13 inches per minute. These feeds are independent of the spindle speeds and have a rapid traverse of 30 feet per minute in either direction. All speeds and feeds are obtained through gear boxes, all gears being encased in oil tight boxes. The machine is being built with two, three or four spindles.



NEW VERTICAL SLABBING MACHINE

The Kissel Motor Car Co., Hartford, Wis., which is working on large contracts for war trucks for the belligerent nations of Europe, has booked an order for 30 ambulance trucks for Serbia. The Kissel company furnished Serbia with a number of trucks last fall. The plant is working night and day at present and George A. Kissel, president, says that it is the company's busiest season.

Letters patent Nos. 1139219 and 1139284 have been issued to S. E. Hitt and J. I. Peyton, Elyria, O., under date of May 11, covering a vacuum chamber ingot mold designed to minimize pipe, segregation and discard. This mold is provided with a removable top piece with vacuum chambers and it is said to have a definite influence on the quality of the steel.

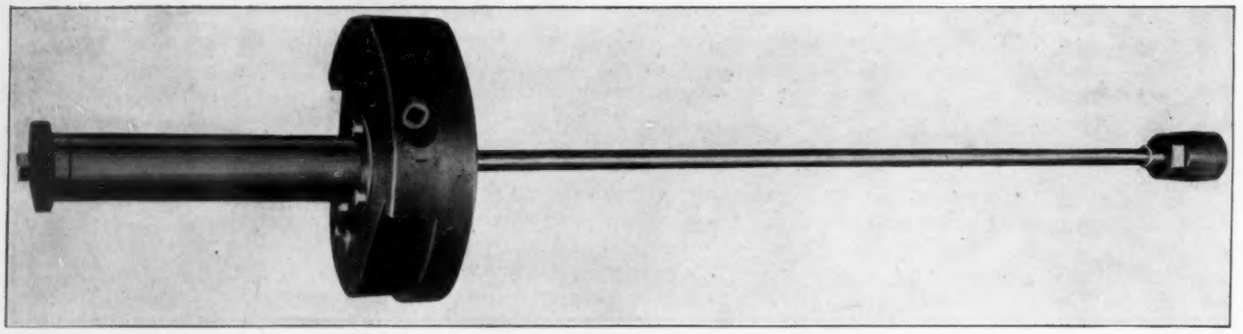


Fig. 1—Boring and Grinding Attachment Without Countershaft

Boring and Grinding Attachment

AN ATTACHMENT designed for installation on lathes or milling machines and adapted for either boring and grinding has been perfected recently by the Woods Engineering Co., Alliance, O. It is said to be specially suited for reboring and grinding scored and worn automobile cylinders or work of similar character.

In Fig. 2, the attachment is shown installed with countershaft and drive on a milling machine. It has a range for grinding holes from 2½ inches in diameter up with a depth limit of 11 inches. A 2-inch eccentric micrometer adjustment is provided.

The spindle runs in double row annular ball bearings. The drive shaft also runs in ball bearings. Where practical, the countershaft is mounted on the over-arm of the milling machine and when mounted in this way it has an adjustment for proper belt tension. It is said that the whole attachment can be set up or removed in 10 minutes. The angle plates for holding the cylinders are adapted to take any cylinder whether cast single or *en bloc* and the work is held in the same position as when originally ground at the factory. When installed on a lathe, the countershaft is fastened overhead. The angle plates are held on a sliding base, which in turn is fastened to the lathe carriage. A vertical and longitudinal movement is provided to facilitate the setting. For boring cylinders which are badly scored, a boring head can be used in place of the grinding wheel. In Fig. 1, the attachment is shown without countershaft.

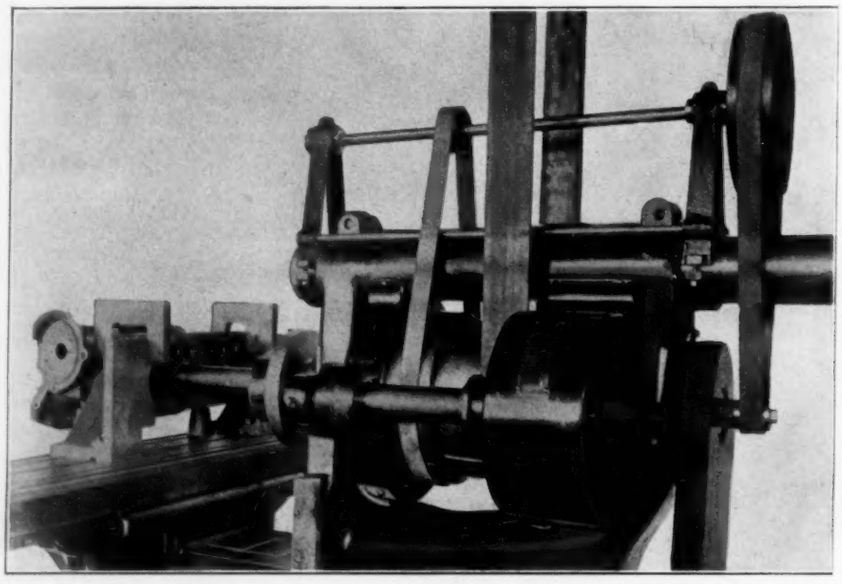


FIG. 2—ATTACHMENT INSTALLED ON MILLING MACHINE

New Reproducing Machine

QUICK, accurate and inexpensive methods of reproducing letters, maps, drawings, blue prints or other written or printed documents have been eagerly sought after in recent years by manufacturers. Hand copying or tracing is necessarily slow and is liable to be inaccurate, while fac-simile reproductions of printed documents are of course impossible by hand.

A machine that has had considerable success recently for work of this character is the photostat, developed by the Commercial Camera Co., Rochester, N. Y. The machine is said to be practically automatic in its operation and the operator is not required to have any expert knowledge of photography. The copies made by the machine are direct reproductions, not being printed from negatives.

The machine, as shown in the accompanying illustration, is practically a large camera equipped with self contained developing and fixing arrangements. It is fitted with a convenient copy holder, with graduated scales for focusing quickly and automatic devices for measuring and handling the prints. The lens is fitted with a prism which acts to invert the image made by the lens so that the prints are in the correct position. In operation, a roll of specially sensitized paper is held in the machine and the subject to be copied is photographed, in a few seconds exposure, directly upon the paper. The paper photograph is then wound directly into the developing bath without being touched by hand, and is cut from the roll by the pull of a

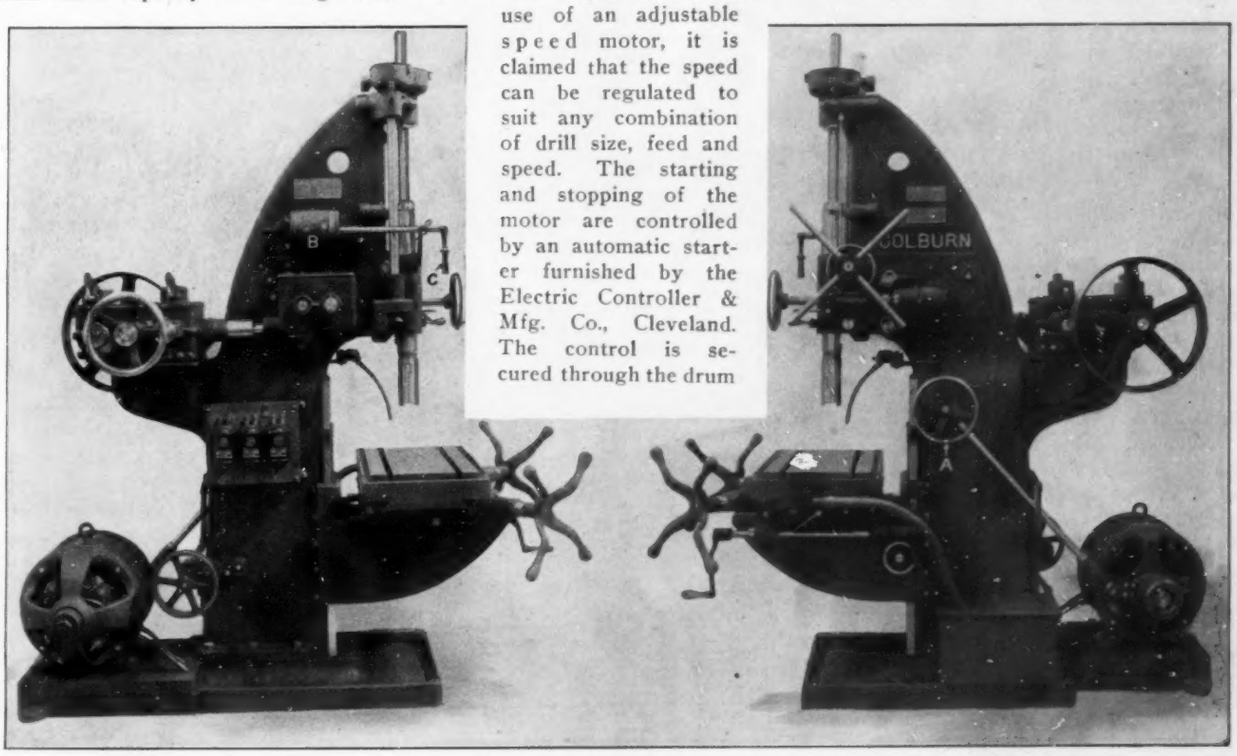
lever. The print is developed in 30 seconds and is then drawn into the fixing bath, where it remains while subsequent copies are being taken. From the fixing bath, the prints are removed to a tank of circulating water and washed free from chemicals. The machine is built in two sizes, the smaller of which stands about 5½ feet high and occupies a floor space of about 3 x 8 feet. The larger model is the same width, but is about 1 foot longer and higher. When assembled, the photostat requires a space of about 10 x 12 feet. In printing, the blacks and whites of the original subject are reversed, the photostat print showing white lettering on a black background. All writing and lines, however, are copied in the correct position and if it is desired to secure black letters on a white background, it is simply necessary to rephotograph the first print.

OPERATOR EXAMINING COPY OF A 36-INCH DRAWING, MADE ON PHOTOSTAT IN LESS THAN A MINUTE

The small machines will produce a print 11½ inches wide and 14 inches long, or smaller, being equipped with a copyboard to hold subjects up to 40 x 33 inches. The larger model will produce a print 13 inches wide and 18 inches long, or smaller, and it is equipped with a copyboard to hold subjects up to 40 x 29 inches. The equipment of the machine consists of a camera with bellows extension, lens, shutter and prism; color screen; light magazine for holding the sensitized paper; devices for rolling and cutting off the prints; developing pan and slide; water and fixing trays; copyholder for holding the subject to be photographed and a chart for centering the subject, so that by racking the camera and copyholder until the indicators come opposite corresponding scale numbers on the camera bed and leg of the stand, a correct mechanical focus is obtained. The machine can be adjusted to copy to scale in reduction, actual size or enlargement. As a result of recent tests by government bureaus, a number of machines were installed at Washington.

Heavy Duty Drill Press

A HEAVY duty drill press driven by an adjustable speed motor with automatic starting control, is shown in the accompanying illustrations. The press is being built by the Colburn Machine Tool Co., Franklin, Pa. It is equipped with a compound table and with high speed drills has a capacity for drilling holes up to 2 inches in diameter in steel. The press is driven by a 5-horsepower adjustable speed motor of the armature shifting type with a speed range of from 450 to 1,800 revolutions per minute. The motor speed changes are effected by turning the hand wheel *A*, which is within convenient reach of the operator. Through the use of an adjustable speed motor, it is claimed that the speed can be regulated to suit any combination of drill size, feed and speed. The starting and stopping of the motor are controlled by an automatic starter furnished by the Electric Controller & Mfg. Co., Cleveland. The control is secured through the drum switch at *B*. This switch has forward, reverse, drift and brake point. When the switch is thrown to the brake position, the motor and drill are automatically stopped. The handle *C* of the drum switch is provided with a special extension, bringing it within convenient reach of the operator at his position in front of the machine.



DRILL PRESS DRIVEN BY ADJUSTABLE SPEED MOTOR AUTOMATICALLY CONTROLLED

New Tool Grinding Machine

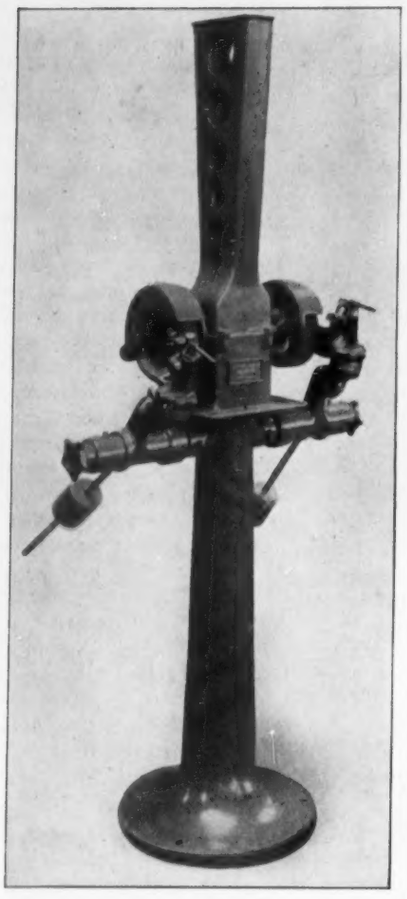


FIG. 1—NEW TOOL GRINDER

A GRINDING machine designed especially for sharpening tools on the two-tool type of bevel gear generating machines has just been developed by the Gleason Works, Rochester, N. Y. The grinding is against the cutting edge of the tool, which eliminates turning up a burr. There is a wheel and tool holder at both ends of the spindle. It is said that the tool holder can be readily set and adjusted for grinding at any special angle.

The machine is of simple construction. Under each wheel is an adjustable swinging arm, carrying a universal tool holder. The upper tools are ground on one wheel and the lower tools on the other. The wheels run in the direction indicated by the arrow, Fig. 2. Each tool holder has a turning movement on its binding stud with a positive stop each way, being set one way for 14.5-degree tools and the opposite way for 20-degree tools. The swivel joint is graduated both ways for setting for any special pressure or rake angle.

The wheel spindle is steel and runs in bronze bearings. The countershaft is equipped with tight and loose pulleys, of 5-inch diameter and 2.25-inch face. The driving pulley is 10 inches in diameter with a 2.25-inch face, and the driving pulley on the machine is 2.5-inch diameter, 2.25-inch face. The countershaft operates at about 675 revolutions per minute. The machine occupies a floor space 18 x 31 inches. Its net weight is 300 pounds and shipping weight approximately 470 pounds.

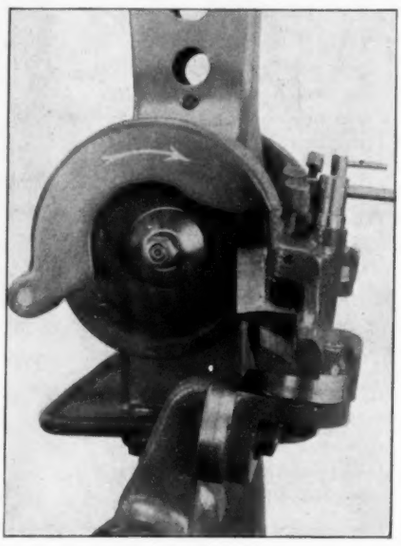


FIG. 2—ARRANGEMENT OF GRINDING WHEEL

Ratchet Wrench and Drill

THE Chicago Mfg. & Distributing Co., Chicago, has recently designed an interesting wrench and drill. The wrench shown in Fig. 1, was originally brought out to meet the requirements of silo and tank manufacturers. It can accommodate square and hexagon sockets, which fit ¼-inch to ¾-inch nuts. Only one application with the socket inserted, is necessary to tighten or loosen the nut.

A combination which has been added is shown in Fig. 2. It consists of a ratchet wrench provided with a set of 10 sockets, a ratchet drill for holding ¼-inch to 29/32-inch drills, and a drill post. The set is said to have a wide variety of uses. A larger wrench has been designed for wood pipe manufacturers, brick kiln operators and bridge erectors. The company is placing on the market a 24-inch wrench, designed similarly to the silo wrench. It has a round handle, into which a crow bar, pipe or rod is inserted to increase the leverage. The tool is capable of heavy service and can accommodate sockets for ¾-inch to 1¼-inch nuts. The wrench is malleable iron and the sockets are steel.

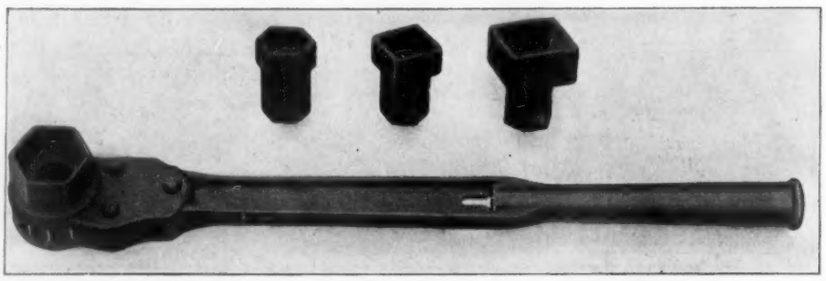


FIG. 1—NEW RATCHET WRENCH

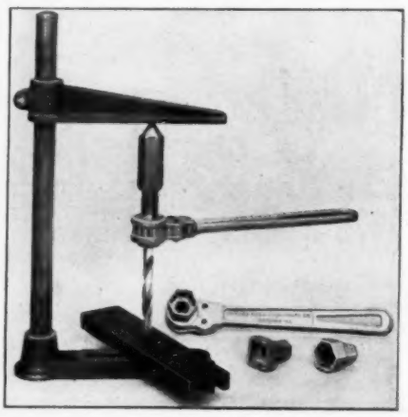


FIG. 2—RATCHET DRILL IN USE

The wheel contact helps to determine the proper grade of wheel to be used on any kind of work. On work of small diameter there is more contact and consequently a harder grade of wheel can be used. In surface or in internal grinding the contact is very much greater so that a softer wheel gives better results.

The Cleveland Crane & Engineering Co., Wickliffe, O., has issued the second number of *Shop Progress*. This publication is devoted to the interests of the employes of the company.

The Utilization of Time Study Data

How Machine Operations Are Divided Into Elemental Items and a Wealth of Information Secured to Aid in Foretelling Shop Costs

BY ROBERT THURSTON KENT

THE object of time study is to determine the amount of work which a man can most efficiently perform in a day. Time studies can be taken in two ways.

Each job that goes through the shop may have the watch held on it and the over-all time of the job, or of its most important subdivisions noted. In the course of years there will accumulate a great number of records of jobs done and the time required for and the methods used in each. These records will prove invaluable in setting rates and fixing minimum times for similar jobs as they recur from day to day. Properly indexed and filed, they are a long step in advance of the earlier method whereby rates have been fixed "off the bat", as it were, by the foreman or rate setter and by which rates are largely based on the judgment or guess of the individual whose duty it is to set them.

Prevents Disputes

They will prevent contentions regarding wage payments and disputes that this rate or that rate is not fair. They present indisputable testimony that the rate is fair, for they represent the time and rate of some former workman who accomplished the job easily. They also enable the management to foretell with considerable accuracy the labor cost of any particular job.

Such a method of making time studies, however, is crude and expensive. It does not give that information most to be desired, aside from the length of time required, as to the most efficient method of performance. It furthermore does not enable the fixing of an accurate rate on a new job unless it is quite similar to one which has been done before. It is obvious that before a shop, doing even a routine line of work, can accumulate an amount of time study data which will be useful, probably several years must elapse. The expense of obtaining these data will be out of all proportion to the benefits returned to the shop at least during the earlier portion of the period while the studies are being made.

The second method of time study—the method being used in those shops which have had the greatest experience in this work and which are successfully applying the principles of Taylor and converting these principles into dollars in the shape of larger dividends, decreased production costs and highly satisfied labor forces—is that of analyzing all machine and work handling operations into the most elementary detail, separating each particular part of an operation into its smallest elements, and tabulating these elements together with their respective times. These elements are then grouped into appropriate classes and filed in such a manner that any element of any particular class can be readily found when desired.

This being done, it is comparatively easy to fix a time for a job, never before put through the shop, with the certainty that the time so set will be accurate, fair alike to employer and employe, and the accuracy of which can be demonstrated to the workman at any time, if he sees fit to question it. The method of consistent machine analysis will enable the manufacturer to accumulate in a comparatively short time, an amount of time study data which will be applicable to a large portion of the work of his shop. Every addition to the data will widen the scope of his time study and rate setting department in an increasing degree.

This method of elementary analysis is a logical method, although at first sight it may not appear to be the easiest one. The natural tendency is for a manufacturer to obtain first a study of the time required for the most important job or the job that recurs most frequently in his establishment, and to then take up in their order the jobs of lesser importance. He feels that he is making the biggest hole in shop inefficiency. He may, and probably will, get quicker results on that particular job, but he is far from making as big a hole as he would were he to adopt the other method.

A good comparison that may be made here is that of ancient and modern methods of recording and transmitting thoughts and ideas, in other words, language. The ancient Egyptians and Babylonians, and even the modern Chinese, had no alphabet. Every idea they wished to express had to be represented by some picture or symbol, whence we have the Egyptian hieroglyphics and the Chinese ideographs. To learn the written language of the Egyptian or the Chinaman, it is necessary for the student to memorize thousands upon thousands of symbols having no relation to each other.

The English language, probably the most virile of all languages past or present, on the other hand, can be resolved into 26 elements, the letters of the alphabet. The symbol of each of the more than 500,000 ideas and thoughts which can be expressed by the English language, is formed by the combination of these 26 letters.

Another example of the relatively few fundamental items which go to make up a most complex whole, may be drawn from the science of chemistry. All the known materials, solid, liquid and gaseous, can be resolved into about 80 chemical elements. These elements combined with one another in varying proportions constitute every material thing in the entire known universe.

As it is with language and with chemistry, so it is with machine shop work. The building of a machine tool is a rather complex proposition requiring the machining and assembling of a great variety of different pieces of varying shapes and degrees of finish. Nevertheless, every one of these many parts can be resolved into a comparatively small number of machine operations.

Elements of Machine Work

In general, machine work can be divided into the turning of cylindrical surfaces, the planing or milling of flat surfaces and the drilling and boring of holes. Every piece entering into a machine tool, is a combination of these various surfaces. This gives us the first subdivision of our time study element. If we know the time required to turn a given cylinder of a known diameter, to plane or face the ends of it and to drill a hole through it, we have a means of ascertaining with fair accuracy just how long it will take to produce the piece in the machine shop. It is necessary

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to add to the time required for performing these various machine operations, time to put it in the lathe or planer and the drill press and to remove it from these machines. We, therefore, subdivide our time studies, first by the machines on which they are made.

Each machine should be studied in the greatest detail in order that the various operations which can be performed upon that machine may be combined with one another to represent the sequence which is to be followed in producing any given piece. This is not as large a job as it seems.

Operations of a Lathe

Although, almost any kind of machine work can be carried out in the ordinary engine lathe, the number of individual operations that a lathe will perform is comparatively limited. Thus the entire art of lathe work may be comprised in the following: We may shift the belt from one cone to another; engage or disengage the back gears; change the feed gears; move the carriage along the ways; operate the cross slide; set the compound rest; throw in or throw out the automatic feed operating either carriage or cross slide; move the tail stock from one position on the ways to the next; set the tail stock over one way or the other for the purpose of turning tapers, or if the machine has a taper attachment, connect the cross slide to it or disconnect it; put on or remove a steady rest or follow rest; remove the face plate and put on a chuck or vice versa; remove or replace head and tail centers; put in the tool post or remove from it one or another type of tool; start or stop the machine; engage or disengage the nut for screw cutting; advance or retreat the tail center.

These 16 operations represent practically everything that can be done with an engine lathe and yet the combination of these 16 elements in varying sequences and numbers, will enable us to perform almost any job of machine work which may be desired. It is true that many jobs which could be done in the lathe, can be done more efficiently in another type of machine, but the fact remains that if we have only a lathe available, we can perform practically any job that comes into the machine shop by a combination of 16 different types of machine movements.

Therefore, it is evident that by making an exhaustive study of all the lathes in a machine shop, that is all the lathes which have different characteristics, we have accumulated an amount of data which will enable us to fix unit times for performing all the jobs possible to do in the lathes in that shop. This is the method advocated for making time study by those who have spent the greatest amount of time at this work. In a similar manner, the operation of a planer, shaper, drilling machine, slotter, boring mill, milling machine or of any other machine tool can be resolved into a comparatively small number of machine movements, which can be studied as to the time required for each, and which later can be combined in any shape and sequence necessary for the performance of any job which may come to that machine.

Obviously, the method of analyzing a machine and its handling time will be productive of real results in the shape of accumulated data more quickly than will any other method of time study. It is true that the machine operations must be analyzed and studied completely before the data can be used. A partial study will be of but little value in setting a general run of tasks, for in all probability the particular machine items which may be needed in setting the task on a given job will be the one on which no time study has been made.

The complete study of a large number of machines does not require such a great amount of time as might be imagined. The writer's colleague, Dwight V. Merrick, during the summer of 1914, made an exhaustive set of studies on a full line of Gisholt boring mills, ranging in size from 30-inch to 84-inch and comprehending every possible machine movement that could be made on a boring mill, including even the oiling of the machine. The investigation, which was probably more comprehensive than any time study investigation ever taken on a similar basis, occupied less than four weeks, that is the actual making of the time studies occupied less than four weeks.

The analyses of the studies after they were made, and the setting of unit times for every possible operation that could be performed on the Gisholt boring mill, required about four weeks' additional time on the part of Mr. Merrick and the writer. The entire investigation, including the analysis and setting of unit time, required the equivalent of 12 weeks' time of one man and about four weeks' time of a $15-a-week clerk, who manipulated the adding machine in obtaining the unit time differences from the observation sheets. If we had the same job to do over again, the time could be materially shortened.

We have shown how time study data should first be subdivided according to machines and then according to machine operations. We will go into this detail a little more closely to illustrate how finely the different machine operations should be subdivided before they are tabulated for recombination into elements forming complete jobs in the shop.

One of the commonest operations which occurs in lathe work is the placing of the cutting tool in the tool post prior to cutting metal and the removal of it from the post upon the completion of the machining operation. The time given in studies on lathe work made by Mr. Merrick for putting an ordinary ¾-inch turning tool in the tool post of a 24-inch lathe is 0.30 minute. This time is made up as follows:

	Minutes.
Get tool from tray at end of lathe	0.03
Measure height of tool	0.07
Put packing in tool post	0.08
Set tool in position	0.03
Tighten tool post set screw	0.09
Total	0.30

The time for removing the tool from the post is tabulated as follows:

	Minutes.
Loosen tool post set screw	0.03
Remove tool to tray at end of lathe	0.05
Total	0.08

If it is necessary to change from one tool to another during the course of the machine work, we have in the same tabulation an item entitled "changing tool". This is made up as follows:

	Minutes.
Remove tool (as above)	0.08
Put in new tool (as above	0.30
Total	0.38

In the same tabulation, we find one more item, "set tool for bearing, 0.17 minute". This item refers to the setting of a square nose finishing tool to bring it square with the surface of the work and is to be added to the time required for setting the tool in the post. Thus if we had to set in the tool post a square-nosed finishing tool, the analysis of the operation would appear as in the first table with the additional item "set tool for bearing" added and the total time would be 0.47 minute instead of 0.30 minute.

Use of Instruction Card

While the item of tool handling is analyzed in the detail explained above, in practice it is put on the instructions issued to the men, as a complete operation. The total time only for the entire operation of tool setting will be given, appearing on the instruction card as an item "set tool in post, 0.30 minute". The value, however, of the detailed analysis is that if the time 0.30 minute is ever questioned as being too long or too short,

we have available the elements which enter into the making-up of this time and can easily ascertain in which particular part of the study the workman or the time study man was at fault.

This is not a particularly good example, however, of this advantage, as the time 0.30 minute is not liable to be questioned unless it is one that recurs quite frequently. However, the principle remains the same whatever the operation may be. There are numerous jobs of which the individual operations occupy many minutes, and if these operations are questioned the detailed analysis is always available to show what the workman is expected to do and how long each element should require. If a workman cannot complete his job in the time fixed, a comparison of his work with the detailed analysis, the watch being held, while the comparison is made, will frequently show that he is exceeding the analysis time in one particular element only and that a correction of his work as regards this element will often bring his performance well within the time called for by the time study.

Making Up a Unit Time

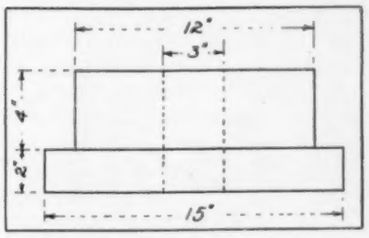
With this digression, let us return to a consideration of the combination of individual elements for the making-up of a unit time for a job. In the first table which we cited, that giving the time for putting an ordinary turning tool in the tool post, we had a list of all the elements common to any tool. In establishing unit times for handling different types of tool than the ordinary round nose turning tool, we have only to add to the elements for that tool those items which are different in the tool under consideration.

We have already pointed out what change is made in the analysis for a square-nose tool. For chamfering or facing tools, we have only to add to the analysis for the turning tool the item of setting the tool to a bearing. For a thread tool, we have only to add the additional item "set tool to thread gage".

Thus in determining unit times for handling any type of tool in the lathe, we can simplify both the time study and the tabulation by first studying the handling of that tool which contains all the elements which the other tools require and then studying those particular elements which are different in the remaining tools.

After having determined a series of elements of various character such as the putting of the tool in the tool post, these elements can be combined with others similarly determined to form complete fundamental operations which enter into the completion of a definite job. Such a fundamental operation is the setting and starting of a cut. In the compilation of time study data on which the writer has been working for a number of months past, the setting and starting of cuts in a great many different sizes of lathes and with practically every variety of cutting tool are tabulated in a manner similar to the following, which is for the setting and starting of a cut with a round nose, rough turning tool in a 24-inch lathe:

	Minutes.
Put tool in post and tighten	0.30
Start machine	0.03
Set calipers	0.35
Set cut by eye or calipers	0.20
Put feed in	0.03
Total	0.91



Typical Instruction Card

Material: Cast iron.
Weight: 200 pounds.
Finish all over.

		Preparation.	Handling work.	Handling tools.	Handling machine.	Removing metal.
(1)	Remove face plate from lathe	0.49	....	....	....	....
(2)	Put chuck on lathe—use hoist	2.08	....	....	....	....
(3)	Move tail stock back	....	....	....	0.28	....
(4)	Land piece in chuck, gripping large dia.	....	2.53	....	....	....
(5)	True piece in chuck	....	2.03	....	....	....
(6)	Put rough turning tool in post	....	....	0.30	....	....
(7)	Change feed and speed	....	....	....	0.50	....
(8)	Set calipers	0.35	....	....	....	....
(9)	Set and start cut	....	....	....	0.23	....
(10)	Rough turn on small diam	....	....	....	....	2.75
(11)	Stop machine, run tool post back	....	....	....	0.15	....
(12)	Change to rough facing tool	....	....	0.38	....	....
(13)	Set and start cut	....	....	....	0.34	....
(14)	Rough face flange	....	....	....	....	1.25
(15)	Move carriage to end of piece, set and start cut	....	....	....	0.43	....
(16)	Rough face small end	....	....	....	....	3.25
(17)	Stop machine, run tool post back	....	....	....	0.10	....
(18)	Change to finish turning tool	....	....	0.38	....	....
(19)	Set and start cut	....	....	....	0.43	....
(20)	Finish turn small diam	....	....	....	....	2.75
(21)	Stop machine, run tool post back	....	....	....	0.10	....
(22)	Change to finish facing tool	....	....	0.38	....	....
(23)	Set and start cut	....	....	....	0.47	....
(24)	Finish face flange	....	....	....	....	1.25
(25)	Move carriage to end of work	....	....	....	0.10	....
(26)	Set and start cut	....	....	....	0.28	....
(27)	Finish face end of piece	....	....	....	....	3.25
(28)	Stop machine, move carriage back	....	....	....	0.10	....
(29)	Change to rough boring tool	....	....	0.38	....	....
(30)	Set and start cut	....	....	....	0.36	....
(31)	Rough bore hole	....	....	....	....	4.00
(32)	Run carriage back, change to finish tool	....	....	0.67	....	....
(33)	Set and start cut	....	....	....	0.36	....
(34)	Finish bore	....	....	....	....	4.00
(35)	Run car'ge back, stop mch., remove tool	....	....	0.23	....	....
(36)	Turn piece end for end in chuck	....	3.13	....	....	....
(37)	True piece in chuck	....	2.03	....	....	....
(38)	Run carriage up	....	....	....	0.05	....
(39)	Put rough turning tool in post	....	....	0.30	....	....
(40)	Set and start cut	....	....	....	0.23	....
(41)	Rough turn edge of flange	....	....	....	....	1.75
(42)	Run carriage back	....	....	....	0.05	....
(43)	Change to finish turning tool	....	....	0.38	....	....
(44)	Set and start cut	....	....	....	0.43	....
(45)	Finish turn flange	....	....	....	....	1.75
(46)	Stop mach., change to rough facing tool	....	....	0.38	....	....
(47)	Set and start cut	....	....	....	0.34	....
(48)	Rough face flange	....	....	....	....	4.00
(49)	Run tool post back, stop machine	....	....	....	0.05	....
(50)	Change to finish facing tool	....	....	0.38	....	....
(51)	Set and start cut	....	....	....	0.47	....
(52)	Finish face flange	....	....	....	....	4.00
(53)	Stop mch., run carriage back, rem. tool	....	....	0.13	....	....
(54)	Remove piece from chuck to floor	....	1.49	....	....	....
(55)	Remove chuck	1.59	....	....	....	....
(56)	Replace face plate	0.88	....	....	....	....
(57)	Clean machine	2.00	....	....	....	....
	Preparation time	7.39	....	....	....	....
	Handling work	....	11.21	....	....	....
	Handling tools	....	....	4.29	....	....
	Handling machine	....	....	....	5.85	....
	Removing metal	....	....	....	....	34.00
	Total time for job	....	....	....	....	62.74

In writing-up the instruction card, this item would be listed simply as "set and start cut, PRB ¼-inch tool, 0.91 minute". After the cut has been completed, if the tool is to be removed, the following items are taken together from the analysis to give the time consumed in stopping the cut

and loosening and removing the tool:

	Minutes.
Throw feed out	0.03
Run tool half way back	0.05
Run carriage back	0.05
Stop machine	0.10
Loosen and remove tool	0.08
Total	0.31

On the instruction card, this item would appear simply as "stop machine, remove tool, 0.31 minute". If, however, the tool was to be run back to the beginning of the cut and an additional cut taken, we would use another set of items appearing in the same tabulation, as follows:

	Minutes.
Set cut by eye or calipers	0.20
Put feed in	0.03
Throw feed out	0.03
Run tool half way back	0.05
Run carriage back	0.05
Total	0.36

Repetition of Items

It will be observed that in this tabulation, the same items occur as appeared in the former ones, except that they are grouped slightly differently and the items of removing the tool and stopping the machine are omitted, as these operations are not performed when repeating a cut without removing the tool from the tool post.

These tables are an excellent example of how elementary time study enables one to build up unit times for different operations. Having the data necessary to fix a time for setting and starting a cut, analyzed in the detail exhibited in the first two preceding tables, it is unnecessary to make a study of the time required for an additional cut. The man familiar with machine work can list without trouble just what motions the lathe hand goes through in running his tool back and re-starting the cut. Having the time for these various items, it is only necessary to set them opposite the items in the new table and total them, and he has the proper unit time for making an additional cut with the same tool.

Examples could be multiplied indefinitely to show how the various elements are combined and built up to form larger and larger fundamental operations until we have a total time for a complete job. The above, however, is probably sufficient to indicate the principle involved.

Time Study in Practice

We will now take up a concrete illustration of the application of the principles of elementary time study to the preparation of an instruction card for a job of lathe work. The instruction card, which is shown in the accompanying table, is modified in form in order that the different classes of elementary times may be separated for purposes of illustration. In all time study, we divide the work into general classes such as preparation time necessary to prepare the machine for receiving the work and for restoring it to its standard condition after the job is done; handling time of the work itself, required to place the work in the machine, remove it and perform any manipulations which are necessary to put it in place for machining, and including hoisting and landing it in the machine, chucking, truing, leveling, squaring and similar operations; tool handling time, that is the manipulation of the cutting tools, putting them in the tool posts, removing them, etc.; machine handling time, which includes all machine manipulation such as moving the carriage, changing speeds, setting and starting cuts and similar operations; machine time which represents the time actually employed by the machine in removing metal.

The first four sets of times are determined by elementary time study. The last set can be best determined by means of the slide rules devised by Mr. Barth. To use these slide rules, however, requires that the machines be standardized as to feeds, speeds and pulling power, according to the rules formulated by Mr. Barth. Unless this standardization has been made, the machine time must be determined by other methods which are slower and more cumbrous.

What the Job Was

Referring now to the instruction card, we see that it calls for the machining of a cast iron piece weighing about 200 pounds, which is to be finished all over and to have the hole in the center bored. It is assumed that a roughing and finishing cut is to be taken for every operation and that different tools are to be used for turning and facing, this being in accordance with the practice of the shop from whose time studies this instruction card was written.

An inspection of the instruction card will show that the first operation is the removal of the face plate which normally remains on the machine and replacing it with a four-jaw independent chuck. A reference to a tabulation of times for handling face plates and chucks shows that 0.49 minute is required to remove the face plate and 2.08 minutes to lift the chuck from the floor by means of a hoist and screw it upon the spindle of the lathe. Both of these items are in the tabulation, subdivided into their elementary details, as explained previously.

Another tabulation shows that it requires 2.53 minutes and 2.03 minutes, respectively, to land a 200-pound piece of the approximate dimensions shown, in the lathe chuck and true it. The sequence of operations followed in machining the work is clearly shown by the instruction card, including the turning of the work end for end in the chuck in order to turn and face the flange of the piece. It will be noted that although there are 57 different items listed, the actual number of operations performed is considerably less than this.

What the Card Shows

A study of the card will show that most of the operations such as "set and start cut" recur from time to time. We have in item No. 6 our old friend, "put tool in post, 0.30 minute", and in items Nos. 12, 18, 22, 29, 43, 46 and 50, the combination of the items "put tool in post" and "remove tool from post". It will be recollected that the sum of these two items, as given previously, was 0.38 minute. We could, in writing the instruction card, of course, have subdivided the items "change to rough facing tool", etc., as above, and given the separate times of 0.30 minute and 0.08 minute, but this would have accomplished nothing except to increase the length of the instruction card. The two items are, therefore, combined in one.

Referring next to item No. 9, "set and start cut, 0.23 minute", this is made up of the items of setting the cut by calipers, starting the machine and throwing in the feed. We have the same time in item 40, which is a cut started under the same conditions as that represented by item No. 9. In item No. 13, we have a time of 0.34 minute for setting and starting cut. It will be observed, however, that this is a facing cut and that there are some additional operations to be performed as compared to a simple turning cut. These include the tightening of the carriage nut after the cut is set and the loosening of it at the conclusion of the cut.

In items Nos. 23 and 51, we see a still different time for the setting and starting of cuts. These it will be observed, are finish facing cuts, and it will be recollected that in the setting of a finishing tool there is the additional item "set tool for bearing" to be added to the time required for setting the ordinary roughing and facing tool.

Time Required for Job

Turning now to the totals of the several columns, it will be observed that 7.39 minutes are required to prepare the machine for the work and to clean it up after the job is finished. The actual handling of the work con-

sumes 11.21 minutes. The handling of the cutting tools requires 4.29 minutes and machine manipulation accounts for 5.85 minutes. A total of 34 minutes is required for the actual removal of metal, giving a grand total of 62.74 minutes. The fatigue allowance would bring the time for the job to about 75 minutes. The interesting thing about these totals is that the machine is working only a little over 50 per cent of the time, if the fatigue allowance is not considered, and less than 50 per cent of the time if the allowance is taken into consideration. This points to two things, the importance of studying closely the manipulation of both machine and work and the value of time study in increasing the relative producing time of the machine. Let us consider these two items in order.

There is no doubt that a man sitting at a desk carefully studying a drawing of a piece such as is shown, can plan out the sequence of operations in manufacturing it much better than the man at the machine, who must necessarily keep his attention on the work while the machine is in operation and do his planning between cuts or do it all in advance of starting work. In either event, the machine will be idle a greater length of time than is necessary. The man at the machine will have a tendency to consider each operation by itself and thus introduce more machine manipulations than are necessary for that particular job. For instance, the chances are that if left to his own initiative, the workman would introduce the finish turning cut immediately after the first rough turning cut. This would require an additional machine manipulation as compared with the method laid down in the instruction card, which calls for the rough facing cut immediately after the rough turning cut, thus saving running the carriage back once. With the work planned out for him by a man preparing an instruction card which shows the best method and the one requiring the least handling of tools and machine, the workman can keep his machine

(*Continued on page* 1138*b*)

Sparks from the Grinding Wheel

By H. O. Tair

A NEW word to enrich our already copious language is "Walshing". To bully, to rage against "capital" and "plutocracy"; having the characteristics of a devil dancer, dervishkearney, a Haywood or a flubdubber; used to rock a feller on the "money" boat.

* * *

It cannot be for a moment supposed that the powers that be consulted with either the railroad or the waterways interests when they announced their Rail and Water divorce decision. Nothing so sensible as the testimony of intelligent, practical witnesses could have been submitted to "the jury". And after Dec. 1 it looks as though counsel for both sides will seek to reopen the case.

* * *

In the general manner of speaking, the "great white way" is the blazing and tortuous avenue to Foolishville. The one avenue does the trick in big cities usually, but out in the Minnesota iron range towns, apparently, even the little side streets raise blazes of white light, the village fathers caring not how the taxes are spent in this and other "improvements". While the mining companies pay most of the taxes, why should the villagers become perturbed?

* * *

A moderate improvement in nuts is reported in Pittsburgh, which may sound like an extract from the local board of health report. Bolts and rivets are doing equally well, and any further improvement by these patients will constitute a welcome bulletin to their many anxious well-wishers.

* * *

Another impetus from grim War! The ship yards on the Delaware river have contracts for new ships aggregating $75,000,000, and there is an important revival at other yards. "Guns and ammunition" are temporarily busying us, but their activity is in a far different category from ships, the building of which is a permanent industry. Our great plants and their armies of workers will rejoice if no one starts an "investigation" into their temerity for wishing to be busy.

* * *

Today the dealers are combing the Western territory for lathes and screw machines, even to the picking up of single tools. Some difference, when not long ago it was orders which were hard to pick up.

* * *

It has been made plain that large machine shops and factories should seek their employes' suggestions in the matter of safety and sanitary precautions. In one month a Milwaukee company received 99 suggestions in its "question box", having asked their foremen and the hands to co-operate. The "question box" has hitherto done duty in high-forehead associations, but why should it not perform an even more practical service in gathering up food for thought that may aid the industrial indigestion now rampant in some shops?

* * *

Why should union machinists stop fighting machine shop efficiency whenever and wherever they can aim a blow at it? Whenever Dinny Cassidy had his forces arrayed in battle line his sole policy of attack was: "Wheriver ye see a head, hit ut!" And as every innovation is a head to the average union agitator, he attempts to "hit ut!"

* * *

A metallurgical engineering gentleman thinks he's found a new use for a metal. He designates his invention as "Rochamboite", a combination bestowing future honor upon both Rochester and Perth Amboy. This new agent, meaning the explosive stuff, looks like sand, creates 2,500 degrees of heat in exploding, and scatters metal that smells like —well, something fierce, but harmless! He got his idea from observing the blast furnace metal. Mebbe, rochamboite will succeed shrapnel; mebbe not.

"Labor has practically no voice in the affairs of this country," recently testified an I. W. W. mouthpiece. And yet over 26,000,000 people work for a living in these United States. If they have no voice in our affairs, what in Sam Hill have they been doing on election days, laying back "aping the idle rich"?

* * *

Sensational items have been given wide vent in the daily press to the effect that, because his brother lost his life by the torpedoing of the Lusitania, J. H. Trumbull, head of a Connecticut electrical material company, would seek revenge by turning his factory into an arsenal of arms for the allies. Mr. Trumbull says his company, having a well-equipped plant, decided months ago to make what it could out of its extra tools and machinery, but, like any American and loyal gentleman, he does not set the loss of his brother against the loss or gain of his country, and he "wants but fair play at any stage of the game."

* * *

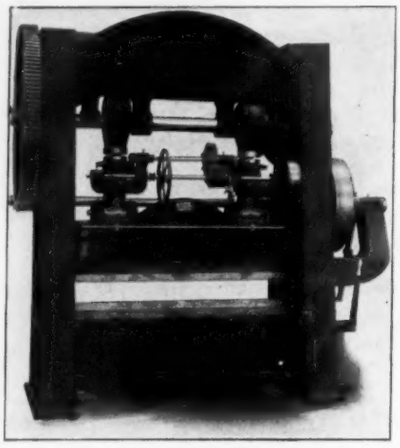
We have unexcelled battleships on the sea, a few submarines under it, a couple of airships over it, but—our industrial low-speed wheels must whirr more rapidly if we are to properly "serve humanity." Our "million men in a day" are much like that "last button" of Napoleon III—all our other buttons are missing and the old-time nail is doing duty by our galluses. Peace has no guarantee like preparedness, and our shops, our foundries, and our factories, if given assurance, will prepare us to maintain peace.

* * *

What the New York *Sun* characteristically calls the "pig iron poet" has been discovered in Allentown, Pa., "a capital of pig iron." There is nothing Tennysonian in pig iron, unless it is that both commodities are now dull and sold mostly in small lots, "most sober in their pace."

Power Brake for Bending Plates

A NEW power brake, the principal features of which are shown in the accompanying illustration, recently has been developed by Bertsch & Co., Cambridge City, Ind. It has been designed for the bending of sheets and plates up to ¼-inch in thickness and in proportioning the various parts, the builder aimed to provide a liberal factor of safety. The main drive is through a friction clutch which is so controlled in connection with an automatic friction brake that the slide head can be stopped at any point in the stroke. The head is adjusted either by hand or power. The adjustments are effected by means of a train of spur and bevel gears operating on the eccentric rod, as shown in the illustration. This machine is designed for a wide variety of work including the forming of parts for steel doors, windows, partitions, metal furniture, lockers, shelving, cornices, etc. It also may be adapted for gang punching.



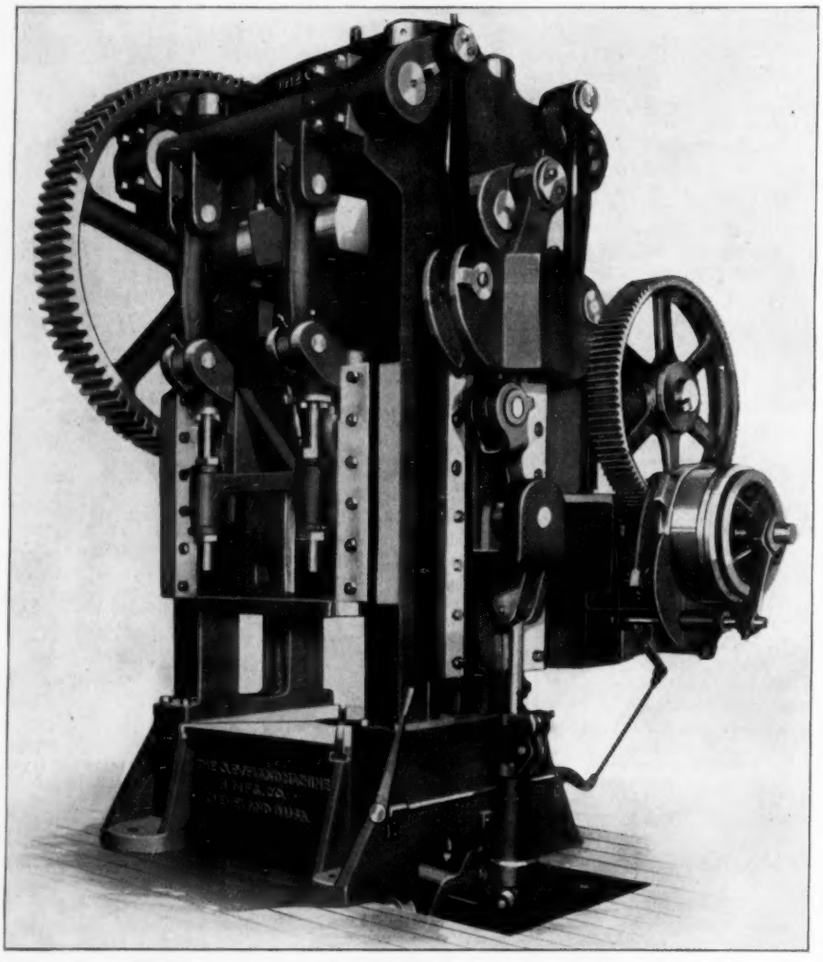
HEAVY POWER BRAKE

The National Machinery Co., Tiffin, O., has issued a four-page pamphlet describing and illustrating its proposed exhibit at the Master Mechanics' and Car Builders' conventions at Atlantic City, June 9-11 and June 14-16 respectively.

Don't forget that a little dirt, or even the fuzz from waste, will throw a lathe center or a tool having a taper shank, out of true and impair the quality of the work.

Improved Toggle Drawing Press

IN A new toggle drawing press recently developed by the Cleveland Machine & Mfg. Co., Cleveland, the distinctive feature is an improved mechanical movement for operating the blank holder slide. This movement is said to give a satisfactory dwell to the blank holder during more than 90 degrees of the travel of the crank shaft, and it is timed to release the blank shortly after the crank passes the bottom center and rises at practically the same speed as the plunger. This gives a maximum period of time in which to remove the stamping and place a new blank in the die. The blank holder and its supports are proportioned to resist a strain equal to that exerted by the plunger during the drawing operation and it is claimed that the rigidity so secured permits extreme draws with a very small percentage of breakages. The frame of the machine, as indicated in the accompanying illustration, is of tie-rod construction with separate bed, arch and housings tied together with steel rods which are shrunk into position under greater stress than the maximum overload capacity of the machine. The housings are tongued and grooved in the bed and arch to preserve the alignment. The crank shaft, which is made of high carbon, heat-treated open hearth steel is 9 inches in diameter in the bearings. The crank pin is 10¼ inches in diameter. The bottom knock-out is operated from the outer slide and is provided with an adjustable kick-off or trip to release the plunger when the stamping is lifted to the top of the die. The plunger acts in an air chamber which cushions the return stroke. The friction clutch is of the multiple



DRAW PRESS WITH IMPROVED BLANK HOLDER SLIDE MOVEMENT

disc type and the brake arms and the clutch discs are locked by toggle links operated by a hand lever. The friction brake ring is separated from the clutch drum so that the heat generated by the brake will not be transmitted to the clutch. This machine is designed to draw and lift out 12½ inches.

The principal dimensions of the machine shown in the illustration are as follows:

Area of bed, inches	52 x 52
Area of blank holder, inches	48 x 52
Area of plunger, inches	35 x 40
Stroke of plunger, inches	26
Stroke of blank holder, inches	18
Distance, bed to blank holder, stroke down, adjustment up, inches	28
Distance, bed to plunger, stroke down, adjustment up, inches	30
Adjustment of blank holder and plunger, inches	8
Diameter of large gear, inches	98
Ratio of large gearing	45: 1
Strokes per minute	7

Inspect Your Goggles

In the last issue of *Safety Hints*, published by the Whitaker-Glessner Co., Wheeling, W. Va., the use of goggles is discussed as follows:

"Safety spectacles should be inspected daily. Toolman, foreman or sub-foreman should have care of such inspection. He should be sufficiently familiar with the construction of eye protection to know at a glance whether or not the spectacles are in perfect condition.

"It is customary to replace broken or mushroomed tools, but it is also important to know that safety spectacles are checked up to their highest efficiency.

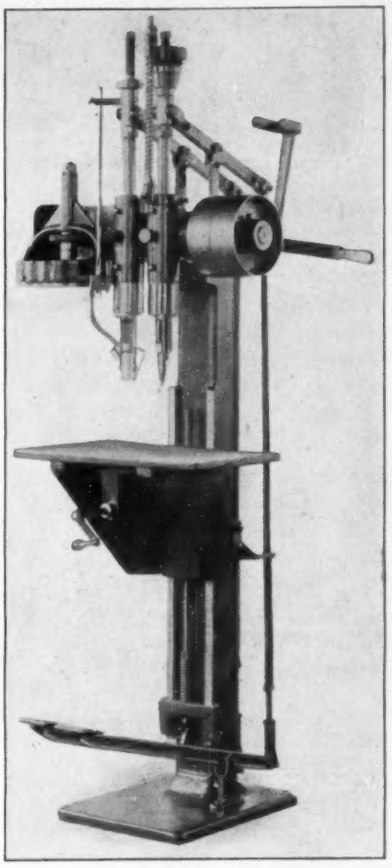
"Fifteen per cent of 1,582 known accidents were eye injuries. While sawing a pipe, a flying particle of lead lodged in the eye of the workman. The injury was slight and was not thought important. It was neglected. The eye was removed at the end of the third day. This accident was avoidable.

"In chipping, grinding or polishing, wear safety spectacles. Perhaps you wouldn't look good in a picture, while wearing spectacles, but better look your worst in a picture than look through one eye the balance of your life."

Calumet Steel Co., Chicago, has issued a booklet describing the methods of manufacturing rail-steel bars for reinforced concrete and explaining the requirements of such bars. Numerous tables make clear the position of various steel materials used in reinforcing. The greater part of the book is devoted to handsome halftone illustrations, showing the application of re-rolled steel bars to reinforced concrete construction.

Screw Driving Machine

IT IS the practice in some lines of manufacturing, especially in sewing machine work, to fasten parts together by temporary screws while machine operations are performed. Upon final assembling these screws are removed and new ones inserted. To perform both operations, removing one set of screws and inserting others, the machine shown in the accompanying illustration has been developed by the Reynolds Pattern & Machine Co., Moline, Ill. As far as the screw setting mechanism is concerned, it is similar to the usual Reynolds machines, one of which was described in the March 11 issue of *The Iron Trade Review*. In addition, however, this machine is provided with an auxiliary spindle placed parallel to and near the screw driving spindle. The auxiliary spindle is driven left handed and is operated by an independent foot lever. It carries a screw removing bit. This bit is normally at rest but when brought down by the foot lever it enters the screw slot and immediately starts in motion, backing the screw out of position. The work is then moved slightly to the left and a new screw is inserted by the screw setting spindle. The screws are fed to the latter spindle from a magazine. This machine also is suitable for the preliminary setting of temporary screws.



MACHINE FOR REMOVING AND DRIVING SCREWS

Gasoline and Benzol

In view of the large public interest being taken in the gasoline and benzol processes devised by Dr. Walter F. Rittman, chemical engineer of the bureau of mines, Secretary of the Interior Lane has issued the following statement:

"Excellent progress is being made in the development of the Rittman processes, and there is every reason to believe that both the gasoline and the benzol processes will be on a commercial working plane within a reasonably short time.

"The benzol process is being developed in co-operation with the Aetna Chemical Co., of New York, which company has entered into an agreement whereby all patentable equipment, processes and ideas available as a result of the co-operative work will be turned over to the department to be dedicated to the public.

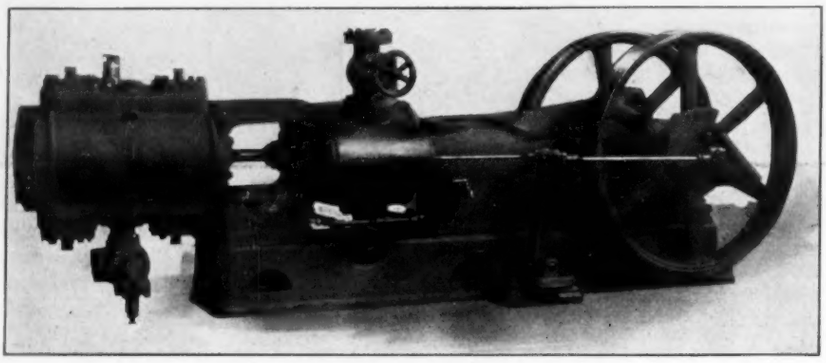
"The department stands ready and is anxious to enter into similar agreements with any other companies in the country that will agree to the same terms. The department is willing for all who are desirous of making use of the processes to do so to the fullest possible extent consistent with the proper protection of the processes in order that the public may derive the greatest measure of benefit therefrom. It looks as if it would be only a short time before the complete mechanical equipment necessary for the practice of the processes has been worked out and the inventions covered by patent applications.

"The department considers that all those desirous of employing the processes should agree to contribute to the public in the same manner that Dr. Rittman has done with his basic patents, all patentable ideas that may be conceived as a result of the employment of these processes. This is the only condition that the department imposes and its reasonableness is apparent.

"As soon as the department is assured that the public's interests are properly safeguarded a full and complete scientific paper describing the processes will be open to any one who wishes to develop them under the conditions imposed."

Small High-Pressure Air Compressor

THE Ingersoll - Rand Co., 11 Broadway, New York, has developed a new small high pressure, steam-driven air compressor, the principal features of which are shown in the accompanying illustration. The air cylinder is provided with Ingersoll - Rogler valves which are independent of any external operating mechanism. It is said that in a test, a 12 - inch stroke compressor was operated at 400 revolutions per minute for a year during which time none of the valves was broken. The steam cylinder is provided with a balanced piston valve designed for the use of high pressure, and if desired, superheated steam may be employed. The cut-off in the steam cylinder is regulated by a centrifugal flywheel governor, which controls the length of the stroke of the piston valve. The moving parts are enclosed, permitting the employment of automatic splash lubrication. In addition to the automatic cut-off, the compressor is provided with an air unloader. This unloader also is said to be practically automatic in its operation.

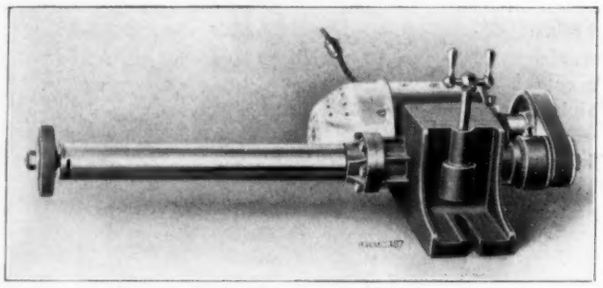


INGERSOLL-RAND 9 AND 9 x 8-INCH STEAM DRIVEN AIR COMPRESSOR

Combination Precision Internal Grinder

A COMBINATION precision internal grinder, developed recently by the Hisey-Wolf Machine Co., Cincinnati, is shown in the accompanying illustration. These machines are designed for a wide range of work. For internal grinding, the angle plate is clamped to the tool post of the machine on which the grinder is to be used. The motor is mounted back of the extension spindle, affording ample working space for the operator and giving him full view and access to the work. Tightening or loosening of the belt by raising or lowering the motor housing is permitted through the dove-tail engagement of the extension housing and motor. Vertical adjustment of the grinding wheel is permitted, as the angle plate is fitted to the extension housing.

The bearings on the wheel end of the motor are bronze and can be adjusted in either direction. They are adjusted from the outside of the housing without removing any part of the machine or grinding wheel. The bearing can be removed by taking off the grinding wheel and one protector cap, the shaft remaining in position. The bearing on the commutator end of the motor and on the pulley end of the extension is of the combination thrust and annular self-aligning type. By this arrangement, either shaft will assume its natural position after any adjustment has been made on the wheel end bearing. By loosening two screws on the commutator end of the motor, the protector cap can be removed, exposing and giving access to the carbon brushes, brush holders and all electrical connections, including the attaching table, all of which are held by spring snap binding posts. The direction of rotation of the machine can be changed easily by reversing the two lead wires from one spring snap binding post to the other. The motors are designed to drive the wheels in either direction.



COMBINATION INTERNAL GRINDER

By removing the extension and fitting the angle plate directly to the housing for external and surfacing grinding in connection with a lathe, planer, milling machine or boring mill, the machine is converted into a direct-connected grinder. The proper grinding speed is obtained without the use of pulley or belt. The machine can be operated with the shaft in a horizontal or vertical position, or at any angle.

The machine is built in two sizes. The smaller is designed for the tool room, while the larger machine is adapted for grinding engine cylinders, drums, journals and all classes of roll and surface work.

The Halcomb Steel Co., Syracuse, N. Y., manufacturer of alloy and tool steels, which seven years ago installed the first electric furnace for steel-making in the United States, has contracted for a three-ton Snyder electric furnace. This furnace will run basic, melting and refining cold material. The original installation was an European furnace. The new furnace, which is of the same type as two now in operation at the plant of the Otis Elevator Co., Buffalo, will have a 24-hour output of 24 tons of refined steel. The foreign furnace was run on hot metal from an open hearth furnace, while the Snyder furnace will operate on cold scrap. This type of furnace is built by the Snyder Electric Furnace Co., Monadnock building, Chicago.

The old notion about keeping oil away from grinding wheels has been largely exploded. This does not mean that oil spots are good for a grinding wheel, as they undoubtedly help it to accumulate dirt and dust. Grinding wheels can be lubricated with oil, water, or almost any compound, as long as it is supplied freely and evenly over the wheel. While soda-water is best for general use, there are places where oil is being used successfully.

JAMES I. McCLEARY

The Spring Meeting of the IRON and STEEL INSTITUTE

ELBERT H. GARY

TWO significant notes were struck clearly and forcibly at the eighth general meeting of the American Iron and Steel Institute at the Waldorf-Astoria, New York City, May 28, which was marked by one of the largest gatherings of iron and steel makers of the country ever assembled.

One of these was that the time has been reached when active co-operation among iron and steel makers and business men in general should be made a reality rather than a hope, if the unexampled opportunities in the world's trade now open to the country are to be realized. The costly folly of indiscriminate attack upon large business in this country in recent years, from all signs, has come squarely home to the public at large and the moment seems singularly propitious when men may meet together on the practical aspects of business without inviting bitter accusations and attacks upon their motives and acts.

The other note which ran through the addresses, private conversations and the whole atmosphere of the assemblage was unmistakably that of optimism as to the prospects of returning prosperity to the iron and steel industry. The evidence of this cheerful conviction that this great industry is coming into its own through the rejuvenation of domestic trade and through the unique position which the country now stands in the commerce of the whole world was in marked contrast to the doubtful and uncertain sentiment manifested at the institute meetings of six months and 12 months previously.

Judge Gary in his opening presidential address sounded the extraordinary need for statesmanship and for the co-operation of business men if the surmounting trade position which has come within the grasp of the United States through the European war, is to be permanently maintained. The principal parts of the address will be found elsewhere in this issue.

Charles M. Schwab, in his address at the evening's banquet, carried further the theme of co-operation. "It is time for others of us to take a serious view of the doctrine of co-operation which Judge Gary has been preaching so many years," said Mr. Schwab. "We have reached the time when such policies are needed. The president of the United States is quoted as saying that business men ought to co-operate and that if the laws prohibit, they should be changed. World-trade demands co-operation. With the prosperity that looms ahead and with the years of great promise that are to come, this is the time to reap the benefit of these things. With the steel makers, at present, some want orders, some have orders and some have orders thrust upon them. Soon we all will have business thrust upon us. I believe we are on the verge of a prosperous era. I feel this is a time when we are going to see good business. Let us have business good in volume, good in sentiment and good in good-fellowship. I believe we are destined to be brought closer together in the bonds of business success by this Institute." Other speakers at the banquet spoke in a similar vein.

Patriotism was stirred at the meeting when the urgent necessity for a stronger national defense was set

A Complete Report of Institute Meeting

ON THIS and the following pages will be found the most complete report of any meeting of the American Iron and Steel Institute ever published in any periodical.

Owing to space limitations, some of the papers read at the meeting are presented in abstract only. The paper by Jerome R. George on the "Development of the Merchant Rolling Mill" and the first installment of Andrew E. Maccoun's exhaustive paper on "Progress in Blast Furnace Practice" are published in full.

In order to aid the reader in locating the various articles, the following table of contents is presented:

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"Waste Heat Boilers", by Chas. J. Bacon	1123
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forth in sober words by Judge Gary. When he said "We should keep the olive branch extended in front so long as possible, but when it is smitten from our hands without cause or provocation by a hostile power that seeks to destroy us, we should, as long as present methods are in vogue, be prepared to protect ourselves,"—the burst of applause that followed left no doubt as to the sentiments of the Institute on this great question. Attorney James H. Hoyt, of Cleveland, at the banquet echoed these remarks with a plea for a stronger army and navy, not for aggression, but for protection. He quoted the memorable words of George Washington on the necessity of preparation for war.

Welfare and other topics were given prominence by the banquet speakers. The only formal address made at that time was by Dr. Lloyd Noland, superintendent of the welfare department of the Tennessee Coal, Iron & Railroad Co., who described with the aid of stereopticon views the welfare work that this company is carrying on to make better and healthier citizens of its workmen in the south. Judge Gary presided as toastmaster and called on various members for informal remarks. A greeting by wireless to the institute from President James A. Farrell, of the Steel Corporation, who now is on the Pacific coast, was read and a reciprocating message of good will was returned by the members.

Immensity of the Iron Business

John A. Penton, managing editor of *The Iron Trade Review*, emphasized the large part that the iron and steel and machinery manufacturers play in the industrial life of the country. Mr. Penton stated that the gross annual value of these manufactures is about $3,000,000,000. He also referred to the large valuation of the export trade in these products. He called attention to the large expenditures and to the remarkable welfare work, some of which had come under his personal observation, which the iron and steel industry now is performing. He said the vastness of the size and activities of this industry was not fully realized and he thought the time had come when these facts should be placed and kept before the country in the end that better treatment in their affairs and better co-operation should be given the manufacturers.

Edward M. Hagar, president of the Hagar Cement Co., and formerly president of the Universal Portland Cement Co., expressed the thought that the iron and steel makers of the country could take a cue from the cement industry in carrying on educational work for the extension of the demand for their products. He cited some of the ways in which the cement manufacturers by thoroughly-planned campaigns had increased their business, as, for instance, in concrete roads, re-enforced concrete construction, etc. The development of the use of the deformed and re-enforcing steel bar, he declared, was due wholly to the efforts of the cement manufacturers and the steel makers had gained this increasing trade without much pains to themselves. He thought a great opportunity for co-operation of the steel and cement manufacturers was present for reducing through a campaign of education the enormous present fire waste of this country, estimated at about $500,000,000 annually. This annual fire loss is much in excess of that of foreign countries. Mr. Hagar announced he was authorized to state in behalf of the cement makers that a committee would be appointed to join with the steel manufacturers to see what could be done to check this great wastage, if the latter cared to take up this question.

King is an Optimist

"I think Judge Gary is less optimistic than he ought to be, even for the near future. Conditions seem indisputably bright for an early resumption of business. In fact, I think the turn has come. For the first time in history we have the whole world for a market. Our financial condition is good and best of all, the crop situation is the best in years."—Willis L. King's remarks on Judge Gary's address at the opening session.

Others who spoke at the banquet were Joseph G. Butler Jr. and Willis L. King.

High Grade Papers

Comment was freely made with regard to the high quality of the technical papers presented at the meeting. These were so selected and arranged on this occasion as to arouse informal discussion and a number of very interesting facts and experiences were brought forth. The paper on corrosion resistance especially developed an extended and spirited discussion by representatives of the various sheet manufacturers.

Andrew E. Maccoun, superintendent of the Edgar Thomson blast furnaces, of the Carnegie Steel Co., Braddock, Pa., opened the program with the paper on "Blast Furnace Advancement". This paper was discussed by A. N. Diehl, of the Carnegie Steel Co., Duquesne, Pa. Jerome R. George, chief engineer, of the Morgan Construction Co., Worcester, Mass., treated the subject "Rolling Mills". This concluded the morning session and during the recess a buffet lunch was served. At the afternoon meeting, the papers were "The Commercial Production of Sound Steel", by Edward F. Kenney, metallurgical engineer of the Cambria Steel Co., discussed by Prof. Henry M. Howe; "Waste Heat Boilers", by Charles J. Bacon, steam engineer of the Illinois Steel Co., discussed by D. S. Jacobus, of the Babcock & Wilcox Co., and by R. E. Lewis, assistant general superintendent of the Saucon plant, of the Bethlehem Steel Co. "Recent Progress in Corrosion Tests", by Daniel M. Buck, metallurgical engineer of the American Sheet & Tin Plate Co., discussed by Dr. Albert S. Cushman, of the Bureau of Research, Washington, D. C.; Prof. Wm. H. Walker, of the Massachusetts Institute of Technology; J. O. Handy, of the Pittsburgh Testing Laboratory; G. H. Charles, vice president of the American Rolling Mill Co., Middletown, O., and John S. Unger, of the testing laboratory of the Carnegie Steel Co.

Officers Re-Elected

At a meeting of the directors of the Institute held at the noon hour, the present officers were re-elected. No action was taken as to the place of meeting next fall. A number of new names were admitted to membership. The total membership roll now numbers 1,230. The registration at the meeting was about 430, which, next to the Chicago gathering in the fall of 1913, was the largest in the history of the organization.

For War Material

Trenton, N. J., May 31.—Ammunition for the fighting countries of Europe will shortly be turned out in this city by the Jordan L. Mott Co., which will erect a new structure, 240 by 100 feet, for the sole purpose of producing war material. The structure will be erected by the Newton A. Bugbee Co., of this city, at a cost of $40,000.

John Helmuth & Co., 30 Church street, New York, have opened a Pittsburgh office at 337 Oliver building, in connection with the steel conversion business they are taking up. The Pittsburgh office is in charge of John Helmuth. The New York office will continue in charge of J. W. Sanders.

Boat Not Rocked by Business Men

Said Judge Gary at Meeting of American Iron and Steel Institute

Urges Building of Greater Navy—Commends the Foreign Policy of President Wilson—Mildly Optimistic as to Business Conditions

JUDGE GARY, in his opening address as president of the American Iron and Steel Institute at the eighth general meeting Friday, May 28, at the Waldorf-Astoria, said there has recently been manifested a disposition to blame the business men of the country for not openly and vigorously protesting against influences which were calculated to prevent the natural and reasonable progress of economic effort. There has, he said, been some grounds for this criticism, but the business man has not been alone in his seeming cowardice, for statesmen of prominence and ability have remained silent on occasions when their voices, if heard in legislative halls, would have been influential. "In times gone by," said Judge Gary, "there have been reasons for the hesitancy of the business man in boldly proclaiming his rights, for it has been worse than useless to speak in favor of the protection and growth of business. Hence the business man suffered in silence. Now, however, the time has come when the business man, even if he represents large interests, may speak frankly and freely about any of the important questions which affect him or those whom he represents."

Judge Gary said that while he had no intention to modify or minimize anything that had heretofore been said by way of admission that there was need of reform in business methods, he believes that governmental agencies have been responsible to a large extent for the interruption of prosperity. "Words might be multiplied," he said, "to illustrate the unfavorable conditions which have prevailed. It is true that various causes, some of which have been removed and ought never to have existed, have had a direct and important influence in producing adversity. This applies especially to conditions which the federal reserve act, recently passed by congress and now in force, was intended to remedy. This act seems to be generally considered as sound and valuable, even though some amendments may be needed.

"But the back of business has been badly bent with unnecessary burdens, and in fact has been near the breaking point. There has been an admonition against 'rocking the boat' and we approve of the sentiment; but we submit the business men have not been rocking the boat."

Judge Gary called attention to the extravagance of governmental methods, and added:

"It is believed if the business methods of the United States government and of its branches and departments were as careful and economical as those of many of the corporations whose presidents are listening to me at this time, hundreds of millions would be annually saved to the people of this country, portions of which are sadly needed for other necessary purposes. Is it too much to ask that hereafter there be elected as legislators and officials of power none except those who possess, with other qualifications, business ability?"

Need for Strong Navy

Judge Gary made a strong plea for better national defense, and especially for a greater navy. On this subject, he said in part:

"We should especially maintain a better navy—one equal, at least, in every respect to that of any other nation. So far as the army is concerned, a large force of reserves, properly trained, with adequate supplies for use in times of emergency, such as General Wood and others advocate, would probably be sufficient. But we should be prepared at all times to protect our borders on the sea and also our commerce wherever it extends. The nation with an inadequate navy must always labor at a great disadvantage with respect to its commerce in times of trouble, or even in times of peace. The protection of our property and our business is essential and can only be secured if we maintain a large navy, which shall include the most efficient personnel and the very best of ships and equipment. It is not necessary to recall the many reasons for a large navy. There is apparent unanimity of opinion at present that we should proceed in this direction systematically and vigorously. We have been inexcusably negligent in this respect. Business men generally have favored every proposed appropriation for this purpose."

Judge Gary gave in detail the figures as to the commerce between the United States and Austria Hungary, Belgium, France, Germany, Great Britain, Italy and Russia in Europe for the years ending June 30, 1910, to June 30, 1914, showing that the total business between the United States and all of these countries amounted to $9,435,593,143, and the balance of exports over imports amounted to $2,293,623,483.

Continuing, Judge Gary said:

"We would be dull of conception if we failed to comprehend the importance of these trade relations; and any act on our part which might tend to sever the connections, or any of them, or to interfere with their natural growth should be condemned as unworthy and unintelligent. For many years, we have been striving to cultivate a spirit of friendship and confidence with our brethren across the seas, because, among other reasons, we realize it is for our pecuniary benefit. This has been specially true of the iron and steel interests and, except for unreasonable and partisan criticisms, not necessary now to locate, much could have been done along legitimate lines to make further progress in the establishment of a permanent international basis of business friendship, which would be of advantage to all and of injury to none. It is sufficient to say that our trade with foreign nations has been increasing, with prospects for more rapid and larger advances and with the expectation of the balances in favor of the United States becoming augmented from year to year. I do not, of course, refer to the volume of business at the present time, for it is abnormal.

"The belligerent nations involved in the tragedy of tragedies are passing through a cataclysm of destruction of life and property. Their losses in both respects are beyond our knowledge and even our comprehension. Devastation, misery and suffering are beyond description; even those connected with the participants by ties of relationship or otherwise have slight comprehension of the suffering that is being endured; and we at this distance cannot imagine the destruction, damage, pain and distress which are entailed. After the swords are sheathed and the guns are stacked; after the hideous noises of battle have

"It is unthinkable that we should become involved in war with any of the foreign countries at this time. We have no inclination, nor have we the ability to engage in war."

ceased and the nations now involved in desperate struggle are ready for settlement, they will be confronted with many most difficult problems, the solution of which will require time and patience, so that the natural progress towards rehabilitation will be impeded. The people, as distinguished from the rulers, will have a voice in bringing the war to a close and in the settlements which are to be made. The doctrine of 'the divine right of kings' will be only a recollection. It is a good guess that many kings and kingdoms will be occupying space on the transition slide.

"But after all differences are adjusted, the nations now or to be engaged in this colossal conflict, though terribly crippled, will take a new start and in many respects a new course, and will begin immediately to build on a better and firmer and more permanent basis for success and high achievement in everything that adds to national wealth, power, energy and enterprise. These nations will not remain inactive or despondent or indifferent. We shall see the most active and persistent efforts to rebuild and extend and to succeed in the international race for supremacy that the world has ever witnessed. From adversity will come greater prosperity than ever before. From necessity will spring thought and study and effort that will enable the survivors to reach greater heights of success than ever before supposed to be within the reach of human kind. The peoples of all the different countries, suffering in their thoughts of the past, will be inspired to greater exertions in their efforts for the future. It is not too much to believe that, after the close of the war, there will be a feeling almost universal that there must be established and maintained a court of arbitration—simple, comprehensive, effective and permanent—that will secure the adjustment of all future differences without any protracted or general contest by armed force. A majority of the nations will, to use an ordinary paradox, 'secure and maintain peace if they have to fight for it.'

"Now what should the United States prepare for? If we conduct our affairs properly, if we make the most of our opportunities, if we cooperate with one another, if the government and governmental agencies and the business people are allies one with the other, we shall become stronger and richer and more potential in our influence, and we shall be able to take a place in the van of nations, progressing toward results more satisfactory than ever before. I made the statement long before the war, and I have made it since, that we might become the leading nation in finance, commerce and industry. I have recently read statements by able financiers that we already occupy this position. I do not quite agree with this claim, notwithstanding what has occurred in Europe during the last year; that is, I do not think we are thus permanently established; but it seems certain that we may reach this position if we properly conserve our resources. We may hold either a primary or a secondary place, depending upon the wisdom, energy and discretion of our people. Much depends upon our management of affairs. There has never in the history of the world been so great a necessity for wise and disinterested statesmanship or for loyal and honorable conduct on the part of the practical business men as at present. Will we do our part? Are we ready to devote our time, our attention and our energies in the performance of our patriotic duty?

Must Maintain Neutrality

"In connection with this subject, it is natural to consider the question of neutrality on the part of our nation towards each of the belligerent nations. Probably all of us will agree that, up to the present time, the attitude of the President with respect to this question has been admirable. He has shown himself to be a true patriot and a wise statesman. In my opinion, the United States has not been called upon to do or to say anything with reference to the war or any of the participants which has not been said or done. Every duty devolving upon the United States has been performed. We may have sympathies or prejudices or notions concerning specific acts or expressions on the part of some or many of the foreign nations, but, in my judgment, they have not required and do not require any act or expression on our part which has not been

Striking Sentences From Judge Gary's Address

WE EXTEND to the people of all foreign countries the hand of business friendship and we ask for their friendship in return. The people, as distinguished from the rulers, will have a voice in bringing the war to a close and in the settlements which are to be made. The doctrine of the divine right of kings will be only a recollection. It is a good guess that many kings and kingdoms will be occupying space on the transition slide.

The time is come when the business man, even if he represents large interests, may speak frankly and freely about any of the important questions which affect him or those whom he represents.

The back of business has been badly bent with unnecessary burdens, and in fact has been near the breaking point. There has been an admonition against "rocking the boat" and we approve of the sentiment; but we submit that business men have not been "rocking the boat".

If the business methods of the United States government were as economical as those of many of the corporations whose presidents are listening to me, hundreds of millions would be annually saved to the people of this country.

"We should maintain a better navy—one equal, at least, in every respect to that of any other nation."

done or made. We have fulfilled every obligation imposed upon us by all treaties or agreements expressed or implied. When the questions which have been discussed and the final and logical conclusion shall have been reached in the light of all the evidence, including the full history of the transactions involved, I think it will be found the above statement is fully justified. It is to be hoped, and I think we may expect, that nothing will occur to disturb the international relations existing at the present time between the United States and each of the foreign nations. It is unthinkable that we should become involved in war with any of the foreign countries at this time. We have no inclination, nor have we the ability, to engage in war. We can prepare, and we should prepare as rapidly as possible, so that if obliged to defend ourselves we cannot be overcome. Some of the belligerent nations are now suffering because their soldiers are not furnished with adequate equipment or supplies. They were not prepared at the beginning of hostilities, perhaps because war was not expected; but even so, they probably did not immediately after war was declared use the diligence required to supply their necessities as they now appear. We may learn by their misfortunes. But war should be the last resort. When the present combat shall have ceased we must be on a friendly footing with all the nations. If our financial and business conditions are such as we claim they may and ought to be, we may be profitable customers of each of the foreign nations, in supplying our necessities and comforts, and they in turn will patronize us. There will be, no doubt, vigorous competition and the foreign nations will do their utmost to secure and retain the trade of agricultural countries who are large importers of manufactured products. However, it is not active competition we fear, provided we are properly protected by our government. All we need and all we ask is an open field and a fair chance, on an equal basis, to compete with all nations for a reasonable share of the world's business. We extend to the people of all foreign countries the hand of business friendship, and we ask for their friendship in return. And we ask for similar reciprocal relations between the leading political forces of the United States and ourselves to the full extent that we deserve. Competition with co-operation is desirable. Competition is, or should be, healthful; but co-operation, which benefits all concerned and injures none, is perfection of economic health and progress. Argument in favor of competition, without recognition of the principle of co-operation, is theoretic and academic, and is neither wise nor practical.

"In the last analysis, the conclusion will be reached by the vast majorities that the best interests of the peoples of all nations will be promoted if the present international equilibrium is substantially preserved. The destruction of any nation would be detrimental to the interests of all others.

"I will add a few words in regard to present business conditions. As you know, during the last three years I have not been especially encouraged as to the immediate future, but as to the long future I have been a consistent optimist, for reasons which have been given from time to time. Assuredly we may build our hopes and expectations on the opportunities which this country offers. It seems to me at the moment the outlook for improvement in our lines of activity are better than they have been for more than a year. This is undoubtedly in part the result of increased exportations at fair prices, due to the European wars, but in my opinion also because of a change in sentiment toward business, which now seems apparent. The captain of industry is again becoming popular in the United States, and this has been brought about by the efforts of business men to satisfy the public in regard to their reasonable demands. The individual, or aggregation of individuals, or the nation, whose standard of conduct conforms to the golden rule will on the average secure the largest measure of pecuniary success. The clouds of distress, suspicion and hostility are breaking. In the rift we may see the sunlight of better things and better conditions."

The Seal of the Institute—Its Details Set Forth

IN CLOSING his address, Judge Gary quoted from the speech made by T. W. Robinson, first vice president of the Illinois Steel Co., in November, 1910, at Chicago, in presenting for the consideration of the Institute a design, afterward adopted by it as the seal of the Institute, as follows:

"In its detail this seal shows you the sword and the spear transfused by the alchemy of wisdom into the plowshare and the pruning hook.

"The crucible represents the birth of steel, the steel of War and the steel of Peace; but these simply surround the central motif, the Spirit of Co-operation symbolized by the bird of Immortality, the Phoenix, rising from the ashes of Discord, Enmity and Strife into the rays of Enlightened Life.

"In its finality, the seal, bound by the sturdy oak and wreathed with leaves of olive, forms perhaps, a fitting laurel to the strength of unity and the gospel of co-operation."

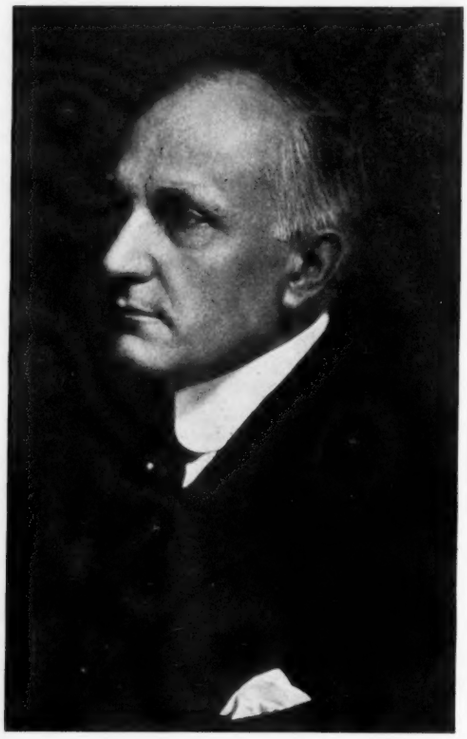
The Cleveland Engineering Society will hold its annual meeting June 8 at the Hotel Statler. At the semi-monthly meeting, May 25, R. I. Clegg, vice president, the Gardner Printing Co., Cleveland, talked on "The Teaching of a Trade".

Members of Institute Hear Instructive Papers Read by This Group of Authors

ANDREW E. MACCOUN,
Superintendent, Edgar Thomson Blast Furnaces, Carnegie Steel Co., Braddock, Pa.

THE papers read at the eighth general meeting of the American Iron and Steel Institute were notable both for the interest they aroused and the high standing which their authors hold in the iron and steel industry of the country. Herewith are presented photographs of the authors of five of the papers. Charles J. Bacon, who discussed "Waste Heat Boilers for Open Hearth Furnaces", is steam engineer, Illinois Steel Co. Edward F. Kenney, who discussed "The Commercial Production of Sound Steel", is metallurgical engineer, Cambria Steel Co. Andrew E. Maccoun, Carnegie Steel Co., read an exhaustive paper on "Blast Furnace Advancement". Jerome R. George, chief engineer, Morgan Construction Co., Worcester, Mass., discussed the "Development of the Merchant Rolling Mill." Daniel M. Buck, metallurgical engineer, American Sheet & Tin Plate Co., discussed "Recent Progress in Corrosion Resistance."

EDWARD F. KENNEY,
Metallurgical Engineer, Cambria Steel Co., Johnstown, Pa.



JEROME R. GEORGE,
Chief Engineer, Morgan Construction Co., Worcester, Mass.

DANIEL M. BUCK,
Metallurgical Engineer, American Sheet & Tin Plate Co., Pittsburgh

CHARLES J. BACON,
Steam Engineer, Illinois Steel Co., South Chicago, Ill.

Commercial Production of Sound Steel

BY EDWARD F. KENNEY

THE IDEAL steel is that which contains no break in the continuity of the metal and in addition contains the same proportions in all parts of the constituents which affect its strength or ductility. The lack of continuity appears in general in three forms; piping, blow-holes, and slag inclusions. Absence of homogeneity is the result of a segregation of the elements, other than iron, present in steel.

Slag inclusions do not occur to any considerable extent in well made steel. Pipes and blow-holes, however, are necessary evils, and one or the other will be present normally in a mass of solidified steel, as solid steel occupies a smaller volume than molten.

The growing use of heat treatment of steels for forgings is giving an added impetus to the movement toward securing uniformity in steels. The rapid cooling of the steel in quenching induces severe stresses. If these stresses are uniform and the resistance of the steel is uniform, the quenching can be done without damage to the steel; but if the hardeners which are affected by quenching are not uniformly distributed, the portions having the hardeners in greater quantity will be subjected to greater stresses when quenched.

The general characteristics of segregation are as follows: segregation is greatest in the portion of the ingot which freezes last; it is most marked in elements whose characteristics differ most widely from those of iron; it is increased in steel which is lively, and decreased in steel which lies dead; it is greater in steel teemed at high temperatures than in steel teemed at more moderate heats.

For the first cause, cropping is the general remedy, but the fact that all segregation does not occur at the top of the ingot renders this method far from satisfactory. Relative to the second cause, the elements which are generally considered most important are carbon, phosphorus, sulphur and manganese. The degree in which they segregate is expressed by the order of sulphur, phosphorus, carbon and manganese. The latter's tendency is very slight, while the other three elements show marked effect of selective freezing in the steel. Where an excess of one is present in any locality in an ingot, the others are probably segregated at that same point.

Wild or lively steel is that in which there is marked ebullition due to evolution of gas. The capacity of steel for holding gases in solution is greater at high temperature than low and therefore steel cast at relatively low temperatures will carry less gas into the ingot molds. Less gas will be thrown out of solution, and there will be fewer blowholes, less active current, and consequently less segregation. In addition, the time occupied in cooling the steel to its freezing point will be reduced with a consequent reduction in the tendency towards selective freezing of the various constituents.

The minimizing of the tendency towards segregation can be effected in two ways, thermally and chemically. The latter is more effective but a combination of the two produces the best results. The thermal remedy is teeming the steel at a temperature high enough to insure clean pouring and avoiding excessive skull in the ladle and danger of freezing up the nozzle. The chemical remedy is deoxidation.

The inverted ingot is highly efficient in preventing irregularly located pipes. Solidification is always progressive from the bottom upwards and when the piped portion from the top is cropped off, only solid steel is left. However, the greater top section means a greater amount of metal discarded. Various methods have been tried for keeping a small body of metal at the top of the ingot fluid until the lower portion has solidified. One method employed by the author is the use of a top composed of a metal casing inclosing a thin lining of dried loam. With the efficient heat insulation obtained with dry loam, it has been found unnecessary to apply heat to keep the metal in the sinkhead molten.

Waste-Heat Boilers for Open Hearths

BY C. J. BACON

THE UTILIZATION of waste heat from open hearth and other regenerative furnaces offers steelmakers an attractive opportunity for increased economy. Existing boilers on large open-hearth furnaces show a saving which, when expressed in terms of fuel required in coal-fired boilers, is equivalent to at least 250 pounds of coal at 1,100 B. T. U. per pound, per ton of ingots. The production of steel in the United States in 1913 was 27,000,000 gross tons and the use of boilers operating on waste heat would save between 150 and 200 pounds of a medium grade of coal, per ton of ingots, an annual saving of at least 2,000,000 tons of coal.

Of the total heat delivered to the open hearth as fuel gas and combustible elements, 45 per cent is wasted through the stack. One-half or two-thirds of this loss may be recovered by boilers at 60 per cent or greater return on the investment. The heat thus saved is in the form of steam and it is customary to express this saving in terms of the coal required in the boiler house for generating the same amount of steam.

The first installation of open-hearth boilers was made in 1910 on a 65-ton furnace at the South Chicago Works, of the Illinois Steel Co. Preliminary tests and calculations indicated that at least 60,000 pounds of gas per hour at a temperature of 1,200 degrees Fahr. was escaping up the stack and it was estimated that the probable gross available output would be 175 boiler horsepower.

A month's test showed a gross output of 190 boiler horsepower during furnace heat with gas at an initial temperature of 1,150 degrees. These results encouraged the installation of two larger boilers. The three boilers have been in almost constant operation since that time and show an average output over a long period of about 280 boiler horsepower for each boiler. As a result, 28 boilers have been installed at another plant and tests on them show that the average evaporation is 393 boiler horsepower during heats. For a year's average, 350 horsepower may be safely counted upon. The effect on open-hearth practice, as a rule, has been to materially reduce the time per heat.

Experience with these boilers has shown that the heat recovered is about 22 per cent of the heat in the coal charged to the producers or about 1,600,000 to 2,200,000 B. T. U. per ton of ingots. In terms of coal contain-

ing about 1,100 B. T. U., this is equivalent to an average of 180 pound per ton of ingots. However, this heat is in the form of steam which, if generated in coal-fired boilers at 60 to 70 per cent efficiency, would require 250 to 300 pounds of coal. Other approximate savings are: 1,600 to 2,000 pounds steam per ton of ingots; 65 to 90 boiler horsepower per 1,000 tons of ingots per month; 65 to 90 boiler horsepower per 1,000 pounds of coal per hour.

Relative to the effect of boilers on the production of steel, when the furnace is new the time required per heat does not appear to be affected to any marked extent, but as the furnace becomes old and the checkers fill up, the influence of the boilers becomes more evident, due to better and more uniform draft from the fans that draw the gases through the boilers.

The cost of installation is about 25 per cent higher than for ordinary coal-fired boilers in spite of the elimination of coal and ash handling equipment, stokers, etc. This increase is due to the abnormal expense of construction work performed on isolated waste-heat units in cramped quarters, changes to buildings, underground flues and foundations and the necessity of applying large steam or motor driven fans. Waste heat boiler installations built during the construction of a new open-hearth plant, should cost considerably less.

The recovery of heat in the waste gases from regenerative soaking pits and heating furnaces presents additional encouraging possibilities, but as a primary consideration means must be adopted for greatly reducing the heat losses and excessive air leakage, characteristic of these types of furnaces. Even if the gas temperature be considerably lower than in open-hearth practice, boilers will be found a paying investment. Heat recovery, by this means, does not cease to be economical until the temperature, at the boiler inlet, is as low as 700 degrees.

Tests for Corrosion Resistance

BY DANIEL M. BUCK

THE PHYSICAL properties of iron and steel may be changed almost at will to meet the largely diversified requirements of consumers. There is one property, however, which steel and iron do not possess—that of stability when exposed to the action of air and water. In an effort to combat this tendency of iron and steel to return to its original oxide form much serious thought has been given by metallurgists and students to corrosion problems. Inasmuch as protected coatings have certain disadvantages considerable study has been given to the possibility of producing a steel or iron which in itself possesses corrosion resisting properties. The writer, who is associated with the American Sheet & Tin Plate Co., after many years of careful study and investigation is a firm believer in the beneficial results which are obtained from alloying small percentages of copper with steel. The effect of copper has been demonstrated by the writer in a series of exhaustive tests of sheet steel exposed to the weather in various parts of the country. The following conclusions are drawn from these tests:

The influence on corrosion of carbon, manganese, phosphorus and silicon in the amounts normally present in properly made steels is practically negligible. In a steel without copper, high sulphur content stimulates corrosion. A copper content of 0.25 per cent materially increases the life of steel and iron and the harmful effect of sulphur up to at least 0.14 per cent is neutralized by 0.25 per cent copper. More copper, up to 2 per cent, gives little if any additional benefit. Lesser amounts than 0.25 per cent have great influence in lowering the corrosion rate. A content of 0.15 per cent is in most cases quite as good as 0.25 per cent and tests now under way prove that a much lower amount, down to as little as 0.04 per cent and 0.06 per cent, while not giving the best result are superior to normal steels carrying only the usual traces of copper. Careful study is being made to definitely determine if possible the mechanism of the reactions which take place by alloying copper with steel and iron, which will explain the beneficial influence of the copper content.

Welfare Work of Tennessee Company

BY LLOYD NOLAND

THE TENNESSEE Coal, Iron & Railroad Co. operates ore and coal mines, quarries, blast furnaces, and steel plants. About 15,000 men are employed, a little over one-half of whom are negroes. About 34 per cent of the employes live in houses owned by the company, and of these, 65 per cent are negroes. A working force of 15,000 men represents a population of about 45,000.

All welfare work of the company is under the management of the department of health and is divided into three sections, sanitary, medical and welfare. The sanitary division is entrusted with providing sanitary living conditions in the various towns.

The medical division furnishes medical and surgical care for all employes except those residing in Birmingham. A district physician is in charge of each of 20 districts. In all, the force includes 35 doctors and 15 nurses.

The company maintains two base hospitals having a total of 44 beds, six smaller hospitals of two to eight beds, and 12 dispensaries. Chemical, bacteriological and pathological work is referred to the thoroughly equipped central laboratory, which in 1914 reported on a total of 3,696 specimens examined. During the same year there were 129,551 applicants for treatment at the dispensaries and 84,621 calls were made at employes' homes.

The expense of the medical division is borne by both company and employes. Any employe living within a certain radius of the works and mines, may request a place on the medical list. For 75 cents a month, he and his dependents are entitled to treatment for any possible ailment.

The welfare division has charge of the club houses located in various towns; the conduct of courses in cooking, sewing and practical housekeeping for both school children and adults; kindergarten instruction of children below school age; home visiting and instruction by social workers and school teachers; supervision over play grounds, schools, and various social organizations, such as boy scouts, camp fire girls, mothers clubs, young peoples club, etc. There are 24 schools with a total enrollment of 3,311 pupils. The work of this department is rapidly increasing.

Development of the Merchant Mill

An Account of the Advancement Made in Merchant Rolling Mill Practice With a Plea for Specialization

BY JEROME R. GEORGE

A WELL-KNOWN writer has recently stated that the rolling mill is the key to all industrial development—that it is, perhaps, the greatest mechanical factor in the civilization of the present day. Probably the most important and the most interesting of all rolling mills is the so-called merchant mill. In fact, the history of all mills for rolling metal shapes, other than flats, commences with and is embraced in the subject of merchant mills.

The first mill with grooved rolls, designed by Henry Cort, in Fontley, Eng., was a merchant mill. For some years, there were no specialty mills, and all rolling mills produced a variety of sections and materials commensurate with the strength of the roll trains and the demands of the trade.

Rails, wire rods, beams, hoops, skelp, and many other sections now produced on specialty mills, were first developed and rolled on merchant mills, and as a rule the merchant mill is still turning out large quantities of all the above-mentioned shapes in addition to a multitude of other old and new forms.

It is natural that a general purpose mill should be rather loosely named. The use of the word "merchant" undoubtedly was first applied to those mills which rolled certain simple sections for stock, and retailed them later, cut to length as ordered. The word is not entirely appropriate as applied to present-day mills rolling a variety of sections and always to order. In this country, however, a merchant mill is any mill which produces regularly more than one shape, and the word "merchant" is so used by the writer. In England a merchant mill is known as a rod mill. In this country many merchant mills are called bar mills.

The writer has in mind a mill in the middle west where there are two rolling mills side by side. One mill has a 10-inch train of rolls, and the other a 14-inch train. The former is called a merchant mill, and the latter a bar mill. At another works not far from the border of New York state, there is a 10-inch mill which is known throughout the works and on the company books as "The Steel Mill". All of these mills, with different local names, roll the same shapes, but different sizes and weights, depending upon the strength of the rolls.

The present normal annual production of the principal rolled steel products in the United States is about as follows:

		Gross tons.
Rails	Rolled on Specialty Mills	3,500,000
Plates	Rolled on Specialty Mills	3,000,000
Sheets	Rolled on Specialty Mills	3,000,000
Wire rods	Rolled on Specialty Mills	2,500,000
Str'c. shapes	Rolled on Specialty Mills	2,500,000
Skelp	Rolled on Specialty Mills	1,000,000
Misc.	Rolled on Specialty Mills	1,000,000
Merchant mill products		8,000,000
Total		24,500,000

Thirty-two per cent of all the steel rolled in the United States is the product of merchant mills, and this proportion would probably hold throughout the world.

With wider and larger markets, many shapes now rolled on merchant mills undoubtedly will be produced on mills especially laid down for the

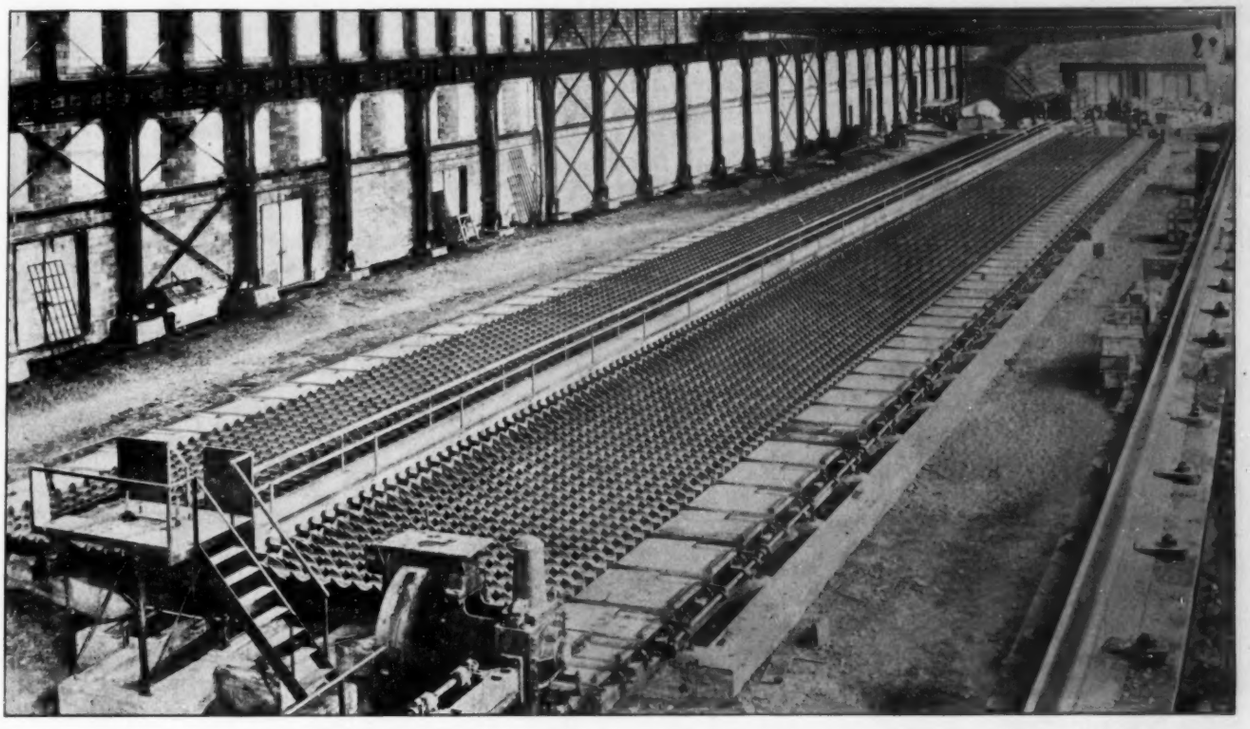


FIG. 1—MECHANICAL COOLING BED WITH NOTCHED RACKS

Presented at the eighth general meeting of the American Iron and Steel Institute, New York, May 28. The author, Jerome R. George, is chief engineer, Morgan Construction Co., Worcester, Mass.

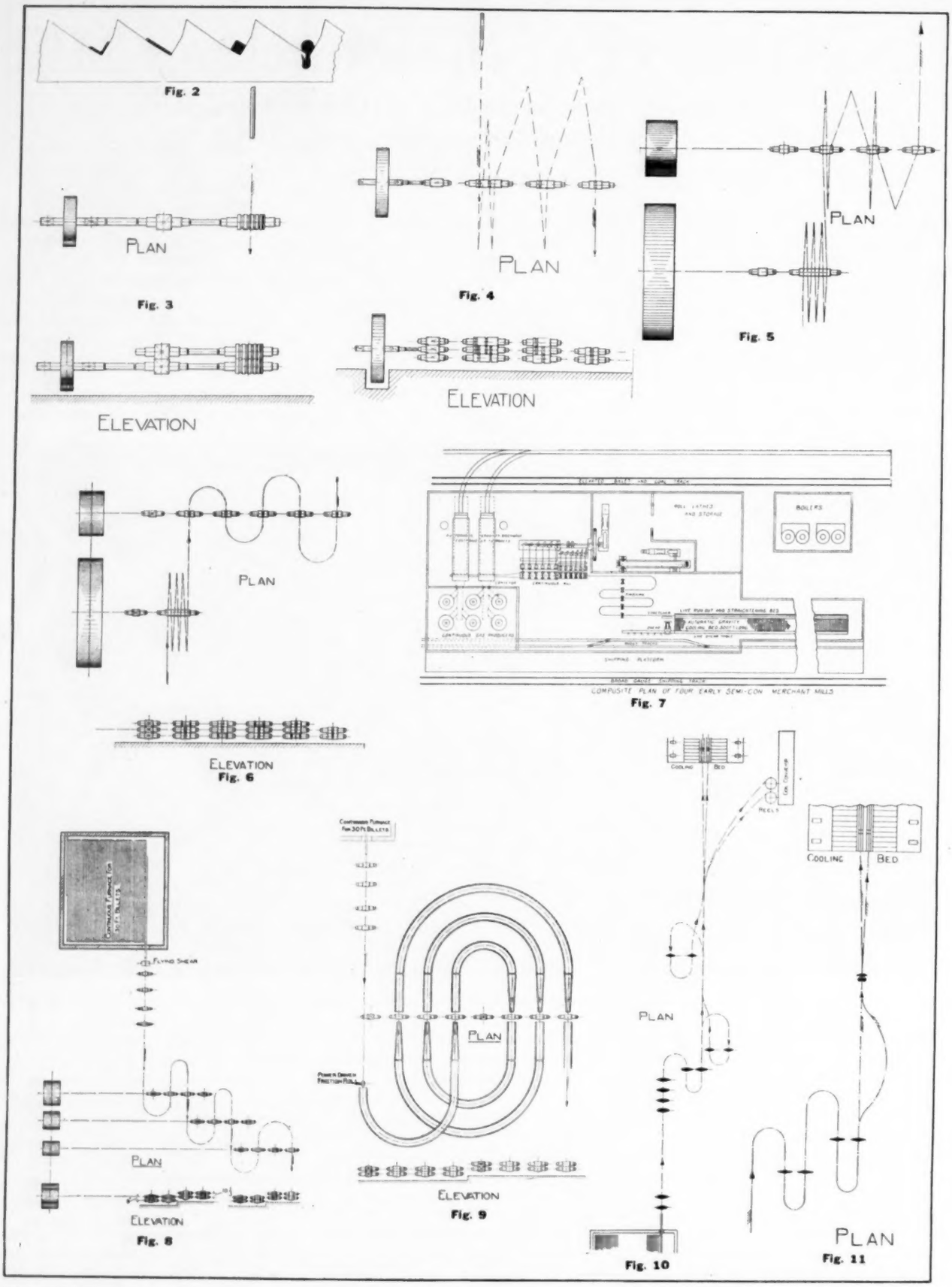


FIG. 2—COOLING BED RACK; FIG. 3—MERCHANT ROLLING MILL, TWO-HIGH TRAIN; FIG. 4 — MERCHANT ROLLING MILL, THREE-HIGH TRAIN; FIG. 5—MERCHANT ROLLING MILL, INDEPENDENT THREE-HIGH ROUGHING TRAIN; FIG. 6—MERCHANT ROLLING MILL, ALTERNATE TWO-HIGH FINISHING TRAIN; FIG. 7—MERCHANT ROLLING MILL, CONTINUOUS ROUGHING TRAINS; FIG. 8—MERCHANT ROLLING MILL, EDWARDS SEMI-CONTINUOUS FINISHING TRAINS AND 30-FOOT BILLET FURNACES; FIG. 9—MERCHANT ROLLING MILL FOR HEAVY SECTIONS, FINISHING TRAIN EQUIPPED WITH AUTOMATIC REPEATERS; FIG. 10 — MERCHANT ROLLING MILL ARRANGED FOR JOBBING WORK, OPERATED SINGLE OR DOUBLE STRAND; FIG. 11—MERCHANT ROLLING MILL, SUPPLEMENTAL SIZING TRAIN

purpose; but it is probable that the merchant mill nevertheless will retain its relative importance as a large producer and continue its important duty of working up business for special mills.

The United States for some years has held a leading position in the steel business, and in the writer's opinion this has been due in large measure to the early recognition of the economic benefits of highly developed specialized rolling mills. If we are to have an open market and at the same time continue to pay higher wages than our competitors, we must pursue this policy even more vigorously in the future. This does not mean, however, that we can afford to neglect the merchant mill in the slightest degree, because, as stated above, it is the main root of the rolling mill business.

The use of rounds chiefly for bolts and rivets has increased to such an extent that for some years past a number of rolling mills have been employed almost exclusively in the production of round sections. The writer suggests it would be proper and beneficial to give up the name "merchant" as applied to these mills and call them round mills. There is always a benefit in understanding and expressing clearly what we are really doing.

Steel bars for reinforcing concrete, used extensively abroad for years and now increasing in use in this country at the rate of about 16 per cent per annum, constitute a rolled product not requiring the usual accuracy of section, and should be rolled at extremely low cost on special mills.

The pressing demand for greater accuracy of section and temper makes it very desirable to segregate the different classes of work in order, first, that this accurate rolling may be assured, and, second, that the general cost of rolling may be kept down. At the present time, there is a marked increase in the demands of users for merchant bars for sections rolled more accurately to size, with better surfaces, and particularly in straighter lengths, and this improvement in quality and additional expense to the mill is not accompanied by any corresponding tendency to higher prices.

All the present mechanical means in sight for improving the quality of merchant bars along the above lines involve the use of special auxiliary equipment, which, if installed, should be kept in constant use; and this is a further reason for classifying and segregating merchant mill work as fast as permissible.

Ordinarily, when a special mill is laid down for the purpose of operating exclusively on a product previously rolled on a general merchant mill, the investment per ton of product is cut from 33 1/3 to 50 per cent, and the cost of labor is reduced from 50 to 65 per cent. Notable examples are to be found in comparatively recent installations for rolling angles and skelp.

Largely on account of favorable labor conditions in Europe, very few specialty mills have been laid down there, although Germany recently made a beginning along this line by contracting for a few mills of American make. Extraordinary development in highly organized mills in Germany can be looked for upon the restoration of normal business conditions.

Economies Through Specialization

In the line of specialization, therefore, economies may be accomplished that do not lie within the province of the rolling mill engineer. This is a question of general policy, to be determined by the management. Another important point in the hands of the operating department, is the systematic scheduling of rolling orders. Up to within a comparatively short time ago, much of the dissatisfaction incident to the merchant mill business resulted from a lack of understanding of the operating difficulties with which these mills have had to contend. The satisfaction of the operator and the customer is dependent upon the infrequency of roll changing, and the importance of this can hardly be exaggerated. A rolling cycle covering the full range of sections in three or four weeks seems to give the best satisfaction all around.

An ordinary rail mill rolling rails from 25 pounds to 100 pounds per yard, covers a range of weights of only 1 to 4, whereas the most favored merchant mill covers a range of weights of 1 to 10, the ordinary mill a range of 1 to 20, and many merchant mills a range of weights of 1 to 60. If, in addition to meeting these extreme conditions, a roller is asked to roll rounds, squares, nut iron, ovals, flats, angles, rails, beams, channels and a multitude of other shapes, and change without notice from one section to another to suit the demands of the sales department and the customer, the result is sure to be dissatisfaction all along the line.

The Early Merchant Mill

For almost a century, the merchant mill retained its original simplicity, and the minor changes and improvements adopted were confined almost wholly to the roll trains. Billets were charged, drawn and fed to the mill by hand. The finished product was rolled in short lengths so that it could be manipulated on the cooling floor by hand.

In the past 20 years all this has changed, and the roll trains of modern mills are almost lost in the mass of mechanical equipment designed to convey the metal to and from the rolls. The cost of a modern notched cooling bed alone equals or exceeds the former cost of an entire mill, and the mechanical problems involved are extremely difficult. Fig. 1 shows one type of notched bed of moderate length with the roll train in the background scarcely visible.

It is not the intention of this paper to go extensively into the many intricate details of modern merchant mills, but brief reference to the mechanical cooling bed should be of interest. The principal feature lies in the rack notch, which presents two surfaces at 90 degrees opposed to gravity, as shown in Fig. 2. The beds consist of live roll conveyors for receiving the stock as delivered from the mill at a speed in some cases up to about 25 feet per second, and with less than one second clearance between bars; means for accurately stopping the stock without injury, and transferring it to the cooling racks; notched racks close enough together to support the lightest material rolled, and so designed that the stock is automatically advanced across the bed; a receiving and assembling table at the end of the racks with means for transferring the assembled bars to the front shear table. All the various operations are performed by electric power. Notwithstanding the fact that these machines are constantly subjected to scale and varying degrees of heat, they have been developed to such a point of mechanical perfection that the cost of operation and maintenance is practically negligible. It will be of interest to learn that one double bed installed in a 10-inch merchant mill, and reduced to the smallest practicable number of parts, contained in all 96,225 pieces, exclusive of the motor parts.

Certain types of merchant mills producing a limited range of flats, large rounds, etc., do not have and do not require the notched type of bed; but practically all modern merchant mills are now equipped with some form of mechanical cooling bed. The large tonnage and superior quality of material, as well as the low cost of production which obtains in modern merchant mills, could not be approached, particularly in small mills, without the long mechanical bed with notched racks.

An interesting feature of these long beds, which are made at present in lengths up to 500 feet, is presented in the opportunity to observe the pe-

culiar effect of molecular changes incident to the cooling of the hot bars. After the bars reach the bed they first contract, then expand several inches, and then finally contract several feet. The movement of the ends of the long bars as they travel first in one direction and then in another, is surprisingly rapid.

Economies Through Improved Machinery

Although the modern merchant mill represents a large investment of capital, the cost per ton of product is no greater than the cost of the lowest type of hand mill laid down under equal conditions. The writer's experience has been that all kinds of merchant mills cost from $5 to $6.50 per ton of product per annum, this investment covering everything necessary to equip and start the mill excepting the land.

Aside from some sacrifice in flexibility, the modern merchant mill is a great improvement over the mills in use 20 years ago. Since that time, the tons produced per man has been increased 400 to 500 per cent, and the work made infinitely easier and safer. The loss in crops and shorts has been reduced 75 per cent. The cost of heating has been reduced 50 per cent, and the total cost of putting billets into finished bars has been reduced on the average from 50 to 60 per cent. The above-mentioned economies have been accomplished in the face of new and more exacting requirements as to accuracy of gage, straightness and temper. The ring and limit gage and the autocratic inspector were little known in the merchant mills of 20 years ago.

The United States can claim all the credit for the entire development of merchant mills during the last 20 or 25 years. Whether or not we can retain our leadership in this work will depend almost entirely upon the restoration of favorable business conditions under which funds will again be available for expansion and development.

Concerning the technical development of the merchant mill, volumes could be written if one ventured into the field of details. The writer will, however, endeavor to present in brief outline the most important steps relating to changes in arrangement of rolls and the introduction of important auxiliary equipment.

For many years all merchant bars were rolled on the simplest possible form of mill, namely, the two-high train type shown in Fig. 3. The bars were given a reduction by passing between the rolls and returned over the top roll for the next succeeding pass. The length finished was usually about 16 feet to 20 feet. Only the simplest forms of guides were used. Then, as now, the most common sections rolled were rounds, and these were made quite true and accurate by first rolling a round bar slightly above the desired area and then passing it through a final finishing groove several times, the roller holding the bar with tongs and turning it 45 to 90 degrees between each pass until the desired roundness was obtained.

The three-high train shown in Fig. 4 was designed to avoid the idle pass over the top roll, and soon replaced the two-high mills and brought about a considerable economy of labor. The number of stands of rolls was increased with the object of enlarging the size of billets and decreasing the number of passes per stand.

Since the tonnage was still limited by the time required to pass the bar several times through the single finishing groove, it was necessary to progress that some means be found to make a round in one pass in the finishing groove. It was finally discovered that if an oval section of certain pro-

(*Continued on page* 1131.)

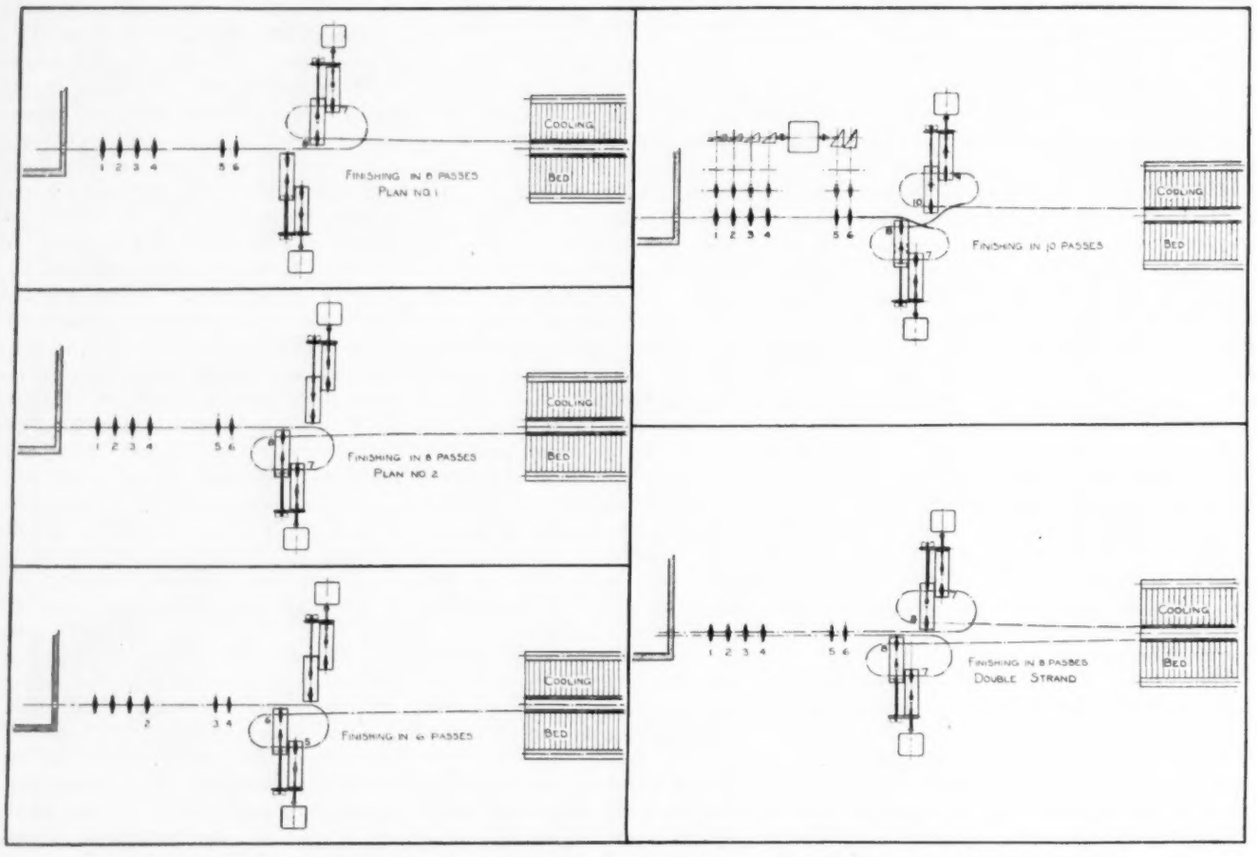


FIG. 12—MERCHANT ROLLING MILL WITH SPARE FINISHING TRAINS AND ARRANGEMENT FOR ROLLING TWO STRANDS OF SMALL SIZE BARS

Progress in Blast Furnace Practice

Factors Involved in Securing Maximum Blast Furnace Efficiency, With Particular Relation to Ore, Coke, Limestone and Air—First of Four Articles

BY A. E. MACCOUN

MANY INTERESTING and instructive papers describing various details of blast furnace advancement have been read in the last few years before the American Iron and Steel Institute, the American Institute of Mining Engineers, and other technical societies. These studies for the most part are devoted largely to separate details. The historical development of the blast furnace and the theory of the process have been touched on very briefly, as these have been fully covered in the technical literature devoted to the subject. However, this paper endeavors to cover briefly some of the important details that are of interest to blast furnace operators.

The production of iron in the blast furnace is at the present time, the most efficient of all metallurgical processes in the transfer of heat, but we may look for a still further increase in this efficiency in the future.

One of the most important factors from which we are to obtain this increased efficiency is in the utilization of the energy contained in the blast furnace gases, and it is to this part of the subject in particular that we will devote most of this study. Greater efficiency in the use of these gases, new labor saving machinery, and devices for obtaining more regular operation, such as distribution, greater uniformity of material, blast, etc., will not only help to increase and improve the product, but will also decrease the cost of production, as these conditions go hand in hand. To obtain these results is the aim of all blast furnace managers.

Raw Materials

To obtain successful blast furnace practice, too great importance cannot be given to the uniformity, both chemical and physical, of all the materials entering into the manufacture of iron. This not only includes ore, coke and limestone, but the blast used for the furnace as well. It is very important that the moisture content of the air be low, and at the same time uniform, in order to obtain regular results.

The ores of the Lake Superior district, bessemer and basic, from the Marquette, Menominee, Gogebic, Vermillion, and the Mesabi ranges, while varying in some respects, are as a rule similar in contents, physical characteristics and structure. It is this class of ores, known as fine ores, upon which our experience in the Pittsburgh district has been principally based. This fact should be kept in mind in studying this paper, as some of the conditions described would no doubt be different on furnaces using a different class of raw materials.

What Makes an Ore Desirable

The desirability of an ore for a blast furnace is based on the percentage of its various ingredients, its physical characteristics and structure, lump value, density, porosity, availability, and to some extent on its degree of oxidation. The percentage of natural iron content is the important governing factor in all ore values, while the amount of moisture contained in the natural state has considerable bearing on the ultimate cost, if the material is transported to any distance. This point is so important that in some cases it is a very profitable proposition to dry the ore before shipment from the mines.

The quantity of rich ores available is decreasing, leaving leaner ores, which are not as desirable. Great progress is being made in the preliminary treatment of these materials by the various concentrating processes. Iron ores are washed that a short time ago did not seem amenable to this process; ores that contain excessive water have their moisture removed by drying; the magnetic concentration of magnetites has become a fact and is being done at very low cost; also pneumatic concentration of hematites is being commercially accomplished and will be still further developed. Some of these products can be used directly in the blast furnace without further treatment, but when too fine they must be either briquetted, nodulized or sintered by some of the well known processes.

Important savings are being made in the treatment of blast furnace flue dust, which was formerly a waste product, by means of all of these various processes, so that in modern practice there should be comparatively small losses from this source.

This interesting subject is a study in itself. Great progress has been made in mining, mixing and classifying the various Lake Superior ores, depending on their different contents and physical structure. Progress along these lines is very important, and helps to greater uniformity in blast furnace practice. Frequently there are large variations in the ores from the same mine.

Large lumps of ore should be crushed as they injure distribution and very often arrive at the tuyeres in an unreduced state, requiring an excessive amount of carbon for direct reduction. Nor is it advisable to have ores of different forms of oxidation in the same burden. However, it is often profitable to use a limited amount of some materials hard to reduce in the burden, such as the various kinds of cinders, etc., but such are used only on account of their low cost, or when operating conditions indicate that their use will benefit the furnace locally.

Blast Furnace Coke

Every effort is being made to attain low fuel economy in blast furnace practice by perfecting distribution, furnace lines and improving the quality of coke, ore and limestone used in the burden.

Fixed carbon alone is efficient as fuel in a blast furnace. A great proportion of our blast furnace trouble comes from the use of dirty coke or coke of poor quality. The former is always due to carelessness in its manufacture; too much stress cannot be given to this point. Coke should be thoroughly screened at the ovens as well as at the furnace bins, as it is foolish to expect to get fuel value out of coke breeze and the small dirty screenings which accompany poorly prepared coke.

Coke dust contains a large proportion of the ash, sulphur, phosphorus and other impurities contained in the coke, and on account of its fineness and its tendency to cause a furnace to scaffold, adds additional irregularities to furnace operations, as the amount of dust received with shipments of coke is not constant, but varies greatly at times, making it impossible to burden the furnace properly to offset the effects of this objectionable ma-

A paper read at the New York meeting of the American Iron and Steel Institute, May 28. The author, A. E. Maccoun, is superintendent, Edgar Thomson furnaces, Carnegie Steel Co.

terial. The impurities in the coke dust, therefore, are detrimental to the quality of iron produced and the coke practice, as well as making the furnace work irregularly, causing slipping, etc.

Some determinations on coke dust, the results of which show that this material is very bad and utterly unsuitable to obtain uniformity in blast furnace practice, are as follows:

ANALYSIS OF DRY COKE DUST.

Fixed Carbon, Per cent.	Volatile Matter. Per cent.	Ash. Per cent.	Sulphur. Per cent.
68.60	3.00	28.40	0.961
71.40	3.20	25.40	1.125
71.15	3.25	25.60	1.250

As mentioned previously fixed carbon only is efficient for a blast furnace, and not all of that, as the ash of the fuel needs to be fluxed to slag and a certain amount of fixed carbon will be required to be burned to simply melt this slag.

It also must be borne in mind that this ash requires one and one-half times its weight of stone, and sulphur over three times its weight of stone, to neutralize or flux, irrespective of the total amount of sulphur to be taken up by the slag. If an excessive amount of sulphur be present, it is necessary to provide means for its removal, which in case the blast temperature limit has been reached, will require an increase in slag volume that can only be obtained at the price of higher coke and limestone consumption. It must also be borne in mind that the weight of slag produced, requires 25 per cent of its weight of carbon to melt it. Thus it can be seen how important it is to reduce the sulphur and ash in coke as much as possible if we are to obtain good results.

The best bee-hive coke suitable for blast furnace use is distinguished by hardness, the power of resisting a crushing lead, and an almost metallic luster, together with freedom from slate enclosures, which raise the ash content. The worst is the soft, dark colored and pulverized variety known as "black ends".

Charging material of this kind practically results in adding coke dust to the furnace burden. This fine coke dust is acted upon by the carbon dioxide (CO_2) from the reduction of the ore, changing the same to carbon monoxide (CO) and dissolving the fine carbon. This action takes place at all temperatures above 710 degrees Fahr., and causes a large loss. The black ends and coke dust contain most of the volatile matter and at the same time, on account of their porous nature, absorb and retain a much greater quantity of the water used in quenching, than the denser varieties of coke.

The use of by-product coke as a blast furnace fuel, has made great advances in this country in the last few years. It is now one of our most important considerations even in the Pittsburgh district, and is of still greater importance to the furnaces located at greater distances from the coal mines.

From a conservation standpoint, we have little reason to be satisfied with the rude and unscientific manner in which bee-hive coke operations are conducted, and even leaving out this consideration, there is a large profit on the side of using by-product coke. This coke as now manufactured at our modern plants, is superior to the Connellsville coke for blast furnace use, on account of its uniform size, weight and analysis, and in addition valuable by-products are recovered, such as coke oven gas, tar, ammonium sulphate and benzol.

By-Product Coke

At first by-product coke burned slowly at the tuyeres of a blast furnace, retarding the speed of melting, and carrying the heat too high up in the furnace stack, and on this account was not favored by blast furnace operators. This has been helped by the use of higher blast temperatures, using perfectly screened coke, breaking it smaller, and in many other ways regulating its manufacture to secure the proper combustibility, so as not to slow down the driving of the furnace.

Progress is being made in washing coal to lower the sulphur content, while promising results also have been obtained from pneumatic separators. There will be further development along these lines in the future, as the advantages of using coke low in sulphur and ash in a blast furnace is now fully appreciated. This subject was adequately discussed in C. A. Meissner's interesting paper on "By-Product Coke", read before the American Iron and Steel Institute, Sept. 23, 1913, and in W. H. Blauvelt's papers read before the American Iron and Steel Institute, May 22, 1914, and the American Institute of Mining Engineers, October, 1912.

Limestone

The limestone used as a flux in a blast furnace should be selected with great care, as many blast furnace troubles are due to irregularities in analysis and size of the limestone used.

Limestone should be thoroughly screened, and in some cases washed, and should not be too large, as large lumps impair the distribution, and often come to the tuyeres unburned, requiring large quantities of heat. It is hardly necessary to point out the injurious effects on the lining of such lumps of corrosive basic material, or the fact that to obtain the greatest fluxing efficiency and smoothness of working, the lime should be burned while intimately mixed with the ore and coke it is intended to flux. The fines in limestone contain very objectionable impurities, as does the coke dust, and they are especially harmful when charged into a furnace irregularly, and in large quantities. A good stone should not contain fines that could be removed by a 1-inch square screen, and should be fairly uniform in size, passing through a 6-inch ring. It should be screened, and not contain any clayey material. The available base should be as high as possible.

It is important in our practice, with ores averaging about 7.5 per cent silica for limestone to be as low and regular in silica content as possible, so as to get more uniform results, as it can be shown that each decrease of 1 per cent silica, between 5 and 1 per cent, amounts to a reduction in cost of approximately 10 cents per ton of limestone. It represents a saving in coke, increased production, and necessarily lower operating cost.

On our bessemer and basic practice, we have found the use of calcite preferable, but on spiegel and ferromanganese, a mixture of one-half calcite and one-half dolomite gives better results, as it gives a more fluid cinder, and allows us to run a more basic slag, and thereby keeps the manganese loss lower.

On the assumption that all silica is fluxed in the ratio of 1.00 to 1.35 per cent, silica to base, the following is true:

LOW SILICA STONE.

	Per cent.
CaO and MgO present by analysis...	55.40
To flux 1.00 per cent silica at 1.35 ratio, CaO and MgO.....	1.35
Available base	54.05

HIGH SILICA STONE.

	Per cent.
CaO and MgO present by analysis...	52.75
To flux 5.00 per cent silica at 1.35 ratio, CaO and MgO.....	6.75
Available base	46.00

Comparing the low silica stone with the high silica stone, we find a difference of 8.0 per cent in available base, which is equivalent to an increased efficiency of approximately 17 per cent.

Nearly 60 per cent of the materials going into a blast furnace is air. The moisture in the air blown into a blast furnace has long been recognized as a very important item affecting the manufacture of iron. Many methods have been proposed for its removal, but the

most successful process that I know of at the present time, is the Gayley dry blast process. It is true that there is a great deal of complicated machinery, etc., connected with this process, but it will be simplified more and more with newer installations, and the cost of installation and operation no doubt will be greatly reduced.

Proper Air Supply

In Mr. Gayley's paper on this subject it was stated that a modern furnace consumes about 40,000 cubic feet of air per minute, and for each grain of moisture per cubic foot, there enters the furnace one gallon of water per hour for each 1,000 cubic feet; that is, if the moisture was one grain per cubic foot, 40 gallons of water would enter the furnace per hour. The variation of moisture from month to month in the Pittsburgh district is shown in the following table:

	Average temperature, deg. Fahr.	Weight of water per cubic foot of air, grains.	Quantity of water entering per hour into a furnace using 40,000 cu. ft. of air per min., gallons.
January ...	37.0	2.18	87.2
February ..	31.7	1.83	73.2
March	47.0	3.40	136.0
April	51.0	3.00	120.0
May	61.6	4.80	192.0
June	71.6	5.94	237.6
July	76.2	5.60	224.0
August	73.6	5.16	206.4
September .	70.4	5.68	227.2
October ...	56.4	4.00	160.0
November .	40.4	2.35	94.0
December .	36.6	2.25	90.0

In connection with the dry blast process or the use of natural blast, special consideration should be given to the air supplied to a blast furnace, its increase in volume with its rise in temperature and the weight of oxygen furnished, for it is this that enters into combustion with the coke and the amount supplied should be nearly constant.

The Tropenas Converter Co., 50 Church street, New York, is erecting an office and laboratory building in Brooklyn, N. Y. The chemical and metallographical equipment already has been purchased and the contracts for the equipment for the physical testing plant will shortly be placed. The site provides sufficient space for the erection of a small experimental plant in which a novel steel producing method will be developed.

The Hopkins & Allen Arms Co. has been incorporated to take over the business of the company of that name in Norwich, Conn., a $400,000 corporation and the Union Twist Drill Co., of Athol, Mass., and Derby Line, Vt.; $4,250,000 capital stock.

Merchant Mill Development

(*Continued from page* 1128.)

portions was held up by metal guides on the receiving side of the finishing rolls, good commercial rounds could be made in one pass. This really great discovery introduced the "guide" mill of today. The finishing of long lengths commenced at this point of development.

In order to get more tonnage on the smaller mills, it was necessary to run the rolls at a greater speed, and the speed was gradually increased up to the point where trouble was experienced in the roughing end of the train because of the rolls not "taking" the billet. To overcome this trouble the first roughing roll was set up independent of the finishing train, as shown in Fig. 5, and run at a lower speed.

The next step forward in the production of light sections came from a new method of working the bars in the finishing train. The early method was to allow the bar to run out on the floor and pick up the last end and enter it into the next pass. It was found that a man could catch the first end in a pair of tongs and turn it back into the next pass, forming a loop which overfed onto the floor. As it was easier to turn in the bar from one roll to another than into another pass in the same roll, the alternate two-high mill shown in Fig. 6 came into use at this stage. The alternate two-high mill later reached its greatest point of usefulness in the Garrett type of rod mills. Overfeed in the loop was slightly reduced by stepping up the roll diameters as the section was reduced.

A condition was soon brought about where the production was again limited by the hand-fed roughing train. Up to this time no mechanical appliance of any nature excepting the hook and tongs had been employed about the roughing or finishing trains. About this time, the steel business in this country experienced a severe and prolonged depression combined with labor troubles, and this led to the installation of a continuous roughing train, as shown in Fig. 7, in the hope of eliminating the troublesome and expensive crew of roughers on the hand mill.

Notwithstanding prejudice and some bad details of construction, the continuous roughing train proved a commercial success for general merchant mill work. Continuous roughing trains were soon added to a great number of the existing merchant mills and to the Garrett wire rod mills. The usual number of men, known as roughers, employed about a stand of hand roughing rolls amounted to 12 in 24 hours, and in 1900, working under 140 card Amalgamated scale, the men earned an average of $3.60 for eight hours on the smallest tonnage mills. The continuous mill displaced nine of these men and in most cases increased the output of the mill 50 per cent.

At about this period, the continuous heating furnace was improved at the delivery end by the gravity end discharge, and this type of furnace came into general and permanent use for all kinds of merchant work.

The notched mechanical cooling bed of greatly increased length was introduced about the same time as the continuous roughing train, and the length of finished bars increased from three to four times.

It was a simple matter to speed up a continuous roughing train to overfeed the finishing pass, and so the output of the mill was again limited at the finishing train. Some considerable improvement in tonnage and yield was in sight, providing bars could be finished in longer lengths and the cooling bed no longer presented any obstacles. The problem of further improvement, therefore, resolved itself into a question of uniform heat treatment throughout the length of the finished bars. This was partially solved by an arrangement of rolls in the finishing train as shown in Fig. 8. The principal feature of this arrangement is that the peripheral speed of each roll is enough less than the speed of the one following to hold back the metal so that much of it lies in the furnace instead of upon the mill floor.

The problem was completely solved by the use of 30-foot small billets heated in a furnace placed close by and immediately in front of the first stand of rolls. With this arrangement of furnace and finishing rolls, the time of exposure from furnace to finishing pass is substantially the same for both ends of the bar regardless of the length finished. The short distance between furnace and mill was made possible by the use of a flying shear. The novel arrangement of roll and pinion housings retained all the advantages of the alternate two-high construction and none of its inherent disadvantages. Mills of this type produce regularly 10,000 tons per month, and on a good day's run will turn

(*Continued on page* 1138c.)

'Hounded to Death by Eager Buyers'

Says a Large Dealer in Tools for Making War Munitions

Purely Domestic Demand in East Practically Unchanged—Pittsburgh District a Scene of Much Activity—Railroads Make But Few Inquiries

INQUIRY for machine tools continues active; although perhaps not as large in volume as on previous occasions since the outbreak of the war, it now is, if anything, more urgent. This is due to the great scarcity of such tools as are suitable for the manufacture of war munitions. Dealers are scouring the country for lathes, turret lathes, screw machines, automatics, etc., and feel well repaid when these efforts enable them to pick up a few machines at a time, since they are able to turn them over immediately at a heavy premium. The great demand for such machines is reflected in the remark of one large dealer, that he is being "hounded to death by eager buyers". In one case a concern which needs a large number of lathes immediately has offered to pay a premium of $200 on each lathe shipped within a week. The volume of business being placed, thus, is not nearly as large as would be the case were the machinery dealers and manufacturers in a position to supply the demand. The three Westinghouse companies continue to inquire for large quantities of equipment for making both rifles and shells. The Union Switch & Signal Co., Pittsburgh, is inquiring for equipment for making shells. The Ingersoll-Rand Co., New York, likewise is inquirinig for a large quantity of equipment for making shells; this company has bought a considerable number of heavy duty drills. The Snead & Co. Iron Works, Jersey City, N. J., again is figuring on a large quantity of equipment to be used in making war munitions.

In addition, a number of individuals and concerns are figuring on equipment for turning out from 500 to 1,000 shells daily, each; most of these inquiries, however, are of a vague character. The Bethlehem Steel Co. has placed further large orders for equipment to be delivered in the future. The Scovill Mfg. Co., Waterbury, Conn., is in the market for a large quantity of equipment to be installed in additions it is erecting; this company has purchased two 5-ton double-hook cranes. The T. C. M. Mfg. Co., Harrison, N. J., manufacturer of automobile parts, is figuring on a good-sized war contract, and if it is obtained it will be in the market for a large number of hand millers and perhaps some other machinery. The Union Twist Drill Co., Athol, Mass., has booked a rifle contract. Inquiry from Italy for lathes and other equipment continues active; some good orders for lathes for future delivery have been placed from that country the last few days. The demand from England, Russia and, especially, France, is active.

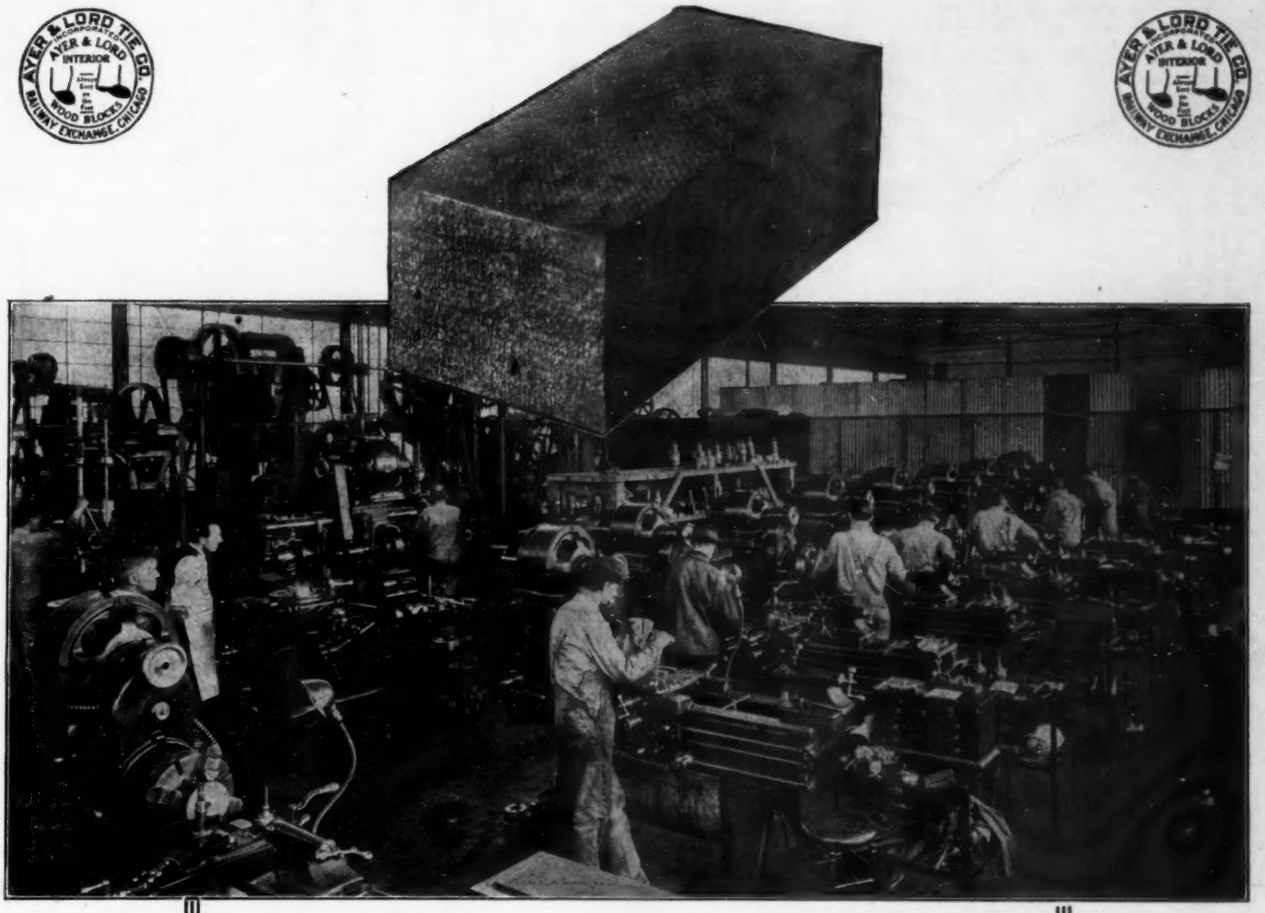
Purely domestic demand in the east does not show much change from the last few weeks. The railroad demand is rather disappointing, there being nothing more in this direction than that a few roads are figuring in a very preliminary way on a few machines. The crane market is quiet and new inquiries are far from numerous. The Vermont Marble Co., Proctor, Vt., has bought a 25-ton Whiting crane. The Harris-Silvers-Baker Co. has bought a 15-ton Pawling & Harnischfeger crane for its new plant at Newmarket, N. J. The Aluminum Co. of America has broken ground for its immense new plant at Edgewater, N. J. The Bethlehem Steel Co. is about to erect a machine shop near Hamburg, N. J. The General Electric Co. will build a large new machine shop at Schenectady. The Sloan & Chace Mfg. Co. and the Universal Copper Works, Newark, N. J.; the Firth Copper Co., Auburn, N. Y.; the American Emery Wheel Co., Providence, R. I.; the National Clock Co., Waterbury, Conn.; the Waterbury Farrel Foundry & Machine Co., Waterbury; the Worcester Mfg. Co., Worcester, Mass.; the J. S. Williams Foundry Co., Buffalo, and other eastern concerns are extending their capacity.

Records Smashed at Pittsburgh

MOST Pittsburgh machine tool dealers are smashing records. Last month was one of the most active months enjoyed in the history of several machinery concerns, and indications are active demand will continue for an indefinite period. Buying of equipment for the manufacture of different types of war material continues heavy and purely domestic demand shows considerable snap. Railroads in western Pennsylvania are not figuring in the market, but industrial concerns are replacing old machinery and buying new equipment. The McKeesport Tin Plate Co., McKeesport, Pa., has sent out inquiries for steel for extensions to a half dozen buildings; nine cranes ranging in capacity from 5 to 20 tons; five engines to be rope driven; 20 tin plate mills; 20 squaring and 20 doubling shears and two 72-inch bar shears. The Carnegie Steel Co. continues to buy equipment for its steel tie finishing plant at Munhall. The Standard Steel Car Co., whose plant at Newcastle, Pa., was damaged by fire several weeks ago will rebuild as soon as possible and will buy some new equipment. The Erie Stove & Mfg. Co., Erie, Pa., contemplates the erection of a new factory. The Reznor Mfg. Co. will erect and equip a new plant at Mercer, Pa. Directors of La Belle Iron Works, Steubenville, O., are considering the erection of a by-product coke plant and several mill extensions.

Too Busy to Handle Italy's Orders

IN CINCINNATI, inquiries for 300 lathes from Italy are before the market. The time specified for shipment, however, is too early to allow any of the Cincinnati manufacturers to take advantage of this business, as lathemakers especially will be busy for several months on present contracts. A large number of lathes have been shipped from Cincinnati to Italy since the outbreak of the war, the principal seller to that country being the Cincinnati Iron & Steel Co. In most cases, the machines sold were 14, 16, 18 and 20-inch turret lathes. The Cincinnati Milling Machine Co., which secured large domestic orders for milling machines during the past month, will use part of the plant of the Cincinnati Shaper Co., in which it has recently secured an interest, for turning out parts for milling machines.



A Smooth, Level, Durable Flooring Proves Invaluable--

especially in places where there is no waste space, because the necessity for even the slightest flooring repair is apt to greatly inconvenience the entire shop.

The illustration above of part of a shop of the Mark Mfg. Company, shows that this concern knows how to use its shop space to the best advantage.

And the fact that Ayer & Lord Interior Wood Blocks have been installed, proves that the Mark Mfg. Company is determined to remove those many delays and troubles that are due directly to inferior flooring.

ASK THEM WHAT THEY THINK of Ayer & Lord Interior Wood Blocks.

Their Answer:

"We would say that the floor we have installed has given us very good satisfaction. In fact, around our plant we have never had any flooring of any kind that has stood trucking so well."

Every user is a satisfied user.

Write at once for our little booklet "FLOORS"—you will find it very interesting.

Ayer & Lord Tie Company

General Office, Railway Exchange, Chicago

CLEVELAND, OHIO—926 Illuminating Bldg.
KANSAS CITY, MO.—1117 Rialto Bldg.
MEMPHIS, TENN.—1402 Exchange Bldg.
PHILADELPHIA, PA.—319 Perry Bldg.

EASTERN STATES

AUGUSTA, ME.—Utilities Car & Machinery Co. has been incorporated; $300,000 capital stock; by E. W. Shutt, Pueblo, Colo.; A. B. Ellison, St. Louis; H. L. Gross, L. J. Coleman and R. S. Buzzell, all of Augusta.

DERBY LINE, VT.—Union Twist Drill Co., Athol, Mass., is having plans completed and proposes going ahead with the erection of new buildings at its branch in Derby Line.

ATHOL, MASS.—Union Twist Drill Co. is reported to have received a large order for rifles.

BOSTON.—Benn Pump Works has been incorporated; $25,000 capital stock; by Edward H. Benn, Samuel Ruff and Camille M. Shea.

BOSTON.—Zunner Machine Co., Rochester, N. Y., is arranging to move its plant to Boston, and expand its business by manufacturing additional lines.

BOSTON.—Michael J. Cahill, manufacturer of knife handles, South Boston, has awarded a contract for a 2-story, 80 x 150-foot, brick and steel building to be used for the manufacture of metal products.

FALL RIVER, MASS. — Wetherell Tag Stringing Machine Co., newly organized with a capital of $100,000, will establish a plant in Fall River to manufacture tag-stringing machines and to do general machine work. Frank L. Carpenter is president.

HYDE PARK, MASS.—Adolph Zuck, 94 Arlington street, is drawing plans for A. Turner for a 2-story and basement, 50 x 100-foot factory to be built in Hyde Park.

LAWRENCE, MASS.—Victor Typewriting Co., of New York, has secured a 10-acre lot on which it will erect a $400,000, 4-story building, and will spend $900,000 to equip it with the necessary machinery. Its present factory, a 6-story building, is located on Greenwood street, New York City, but the lease expires Nov. 1, 1916, so that it will be necessary to have the new building ready at that time. When in operation the new plant will turn out 52,000 machines a year.

PALMER, MASS.—Hamilton Emery Co., which has been contemplating locating in Palmer, has decided to engage in business at Niagara Falls, N. Y.

WORCESTER, MASS.—Graton & Knight Co. plans a storage building addition.

WORCESTER, MASS.—Norton Co. plans erecting another office building this summer.

WORCESTER, MASS.—Worcester Electric Light Co. will spend $210,000 in doubling the capacities of its Webster street and Chase court power plants. At the Webster street plant there will be an addition to the boiler house, large enough for eight additional boilers, each provided with two sets of mechanical stokers; turbo-blowers, a water heater and other equipment will be installed.

WORCESTER, MASS.—Worcester Mfg. Co. will move from its present location at Vine and Foundry streets to the Osgood Bradley industrial building, thereby increasing its capacity for turning out other specialties than the Blunt door check. Orders for making parts of shrapnel are under consideration. John P. Bird, general manager of the National association of manufacturers, of New York, formerly of Cleveland, has acquired a financial interest in the company.

WORCESTER, MASS. — Pan-American Match Co., of Masachusetts, has been incorporated to manufacture match-making machinery and matches; $500,000 capital stock; by Willard W. Sterling, Worcester, president; Charles F. Clark, Westfield, Mass., vice president, and Frank O. Hudson, Westfield, treasurer. The company takes over the Worcester business of the company by the same name, which is incorporated in Delaware with $5,000,000 capital stock. The latter owns property in Worcester, North Baltimore, O., and Rensselaer, Ind.

BRIDGEPORT, CONN.—Alb. and E. Henkels, Inc., has been incorporated to manufacture textile machinery, tools, etc.; $250,000 capital stock; by Max Henkels, T. Albert Phillips and James E. Marr.

HARTFORD, CONN. — Jacobs Mfg. Co., manufacturer of drill chucks, is having plans prepared by Greenwood & Noerr for a 3-story, 42 x 110-foot, steel and brick factory building at Park street and Rowe avenue.

NEW HAVEN, CONN.—Yale Electric Co. has been incorporated to manufacture electrical goods; $100,000 capital stock; by George S. Rugin, New Haven; Arthur G. Olney, New York, and George O. Brott, Hartford, Conn.

NOANK, CONN.—Palmer Bros. shipyard in Noank, idle for several months, has been leased by Pendelton Bros., of New York, and will be used by that concern for making repairs to its fleet of sailing craft.

WATERBURY, CONN.—Waterbury Farrell Foundry & Machine Co. has completed plans for a 3-story, 50 x 150-foot addition.

WATERBURY, CONN. — National Clock Co., 31 Cherry avenue, will start work at once on a 2-story, 42 x 82-foot addition.

WATERBURY, CONN. — Waterbury Tool Co. will have plans completed shortly for its proposed 1-story, 100 x 200-foot, steel and brick machine shop, with a wing, two stories, 30 x 100 feet.

PROVIDENCE, R. I. — American Emery Wheel Co. has started work on a 75 x 110-foot addition to its plant at Waterman and East River streets.

ALBANY, N. Y.—Municipal Gas Co. has let a contract and will begin work at once on a $500,000 2-story, 125 x 200-foot power plant.

ALBANY, N. Y.—Engineer Thos. E. Murray, care of the New York Edison Co., Irving place and East Fifteenth street, New York, has let contracts for a $160,000, 2-story power house to be erected in Albany.

AMSTERDAM, N. Y. — Klauder-Weldon Dyeing Machine Co., will build an addition, one and two stories, 200 x 250 feet, to its factory. Peuckert & Wunder, Philadelphia, are preparing the plans.

AUBURN, N. Y.—Firth Copper Co. has let contract for a 1-story, 105 x 150-foot addition.

BROOKLYN.—The plant of Robins Dry Dock & Repair Co. was damaged by fire.

BROOKLYN. — Morris Holding Co., 297 Ryerson street, has let a contract for a $45,000 boiler house extension at 194 Grand avenue.

BROOKLYN.—Grand Union Tea Co., 68 Jay street, has let contract for a 10-story 51 x 85-foot factory building at Jay and Front street.

BROOKLYN.—Tropenas Converter Co., 50 Church street, New York, has let a contract for erecting a 2-story, 25 x 40-foot, laboratory and office building, on Nostrand avenue, near Avenue I, Brooklyn. Chemical and metallographical equipment has been placed, and equipment for the physical testing plant will be purchased shortly.

BRONX, N. Y.—Cube Mixer Mfg. Co., machinery, concrete mixing plants, mortars, has been incorporated; $10,000 capital stock; by J. J. Hegh, J. J. and A. Cahn, 301 East 149th street, Bronx.

BUFFALO.—J. S. Williams Foundry Co. has let contract for 1-story, 33 x 136-foot and 82 x 142-foot pickling and storage building.

LOCKPORT, N. Y.—Fibre Corporation will rebuild the mill recently badly damaged by fire and will erect a large paper mill in addition.

LONG ISLAND CITY, N. Y.—Ford Motor Co., Detroit, has let a contract for an 8-story, 200 x 325-foot assembling plant in Long Island City, plant having been under contemplation for sometime.

NEW YORK. — Ingersoll-Rand Co., 11 Broadway, is inquiring for a large quantity of equipment for making projectiles.

NEW YORK.—Union Switch & Signal Co., 30 Church street, is in the market for a large amount of equipment for making projectiles.

NEW YORK.—Sound Engineering & Construction Co. has been incorporated; $10,000 capital stock; by R. J. Leibenderfer, W. G. Lynch, 1476 Broadway.

ROCHESTER, N. Y.—Shongo Construction Co., contracting, manufacturing, steam shovels, engines, motors, has been incorporated; $50,000 capital stock; by J. J. Shea, D. L. Taylor, C. Ludington.

SAVANNAH, N. Y.—Enkel Motor Co., combustion engines and explosion engines, has been incorporated; $100,000 capital stock; by K. Dellgren, C. H. Williams and C. A. Thomas, Auburn, N. Y.

SCHENECTADY, N. Y.—General Electric Co. is about to begin work on its proposed $160,000, 1-story, 60 x 320-foot machine shop addition.

SYRACUSE, N. Y.—H. H. Franklin Mfg. Co. has let contract for a 3-story, 56 x 80-foot addition.

ERIE, PA.—The board of education contemplates the erection of a $300,000 high school in South Erie.

HUNTINGDON, PA. — Aetna Explosives Co., New York City, has purchased about 380 acres of land from John J. Westbrook, Huntingdon, for approximately $30,000, for the erection of a plant, for the manufacture of war munitions, according to reports.

JOHNSTOWN, PA. — Surveys have been made by Sumerset Street railway for a line to connect Johnstown and Rockwood, a distance of 36 miles.

NEWCASTLE, PA.—American Car & Ship Hardware Co., which by permission of the city occupies the blind end of Mechanics street, has asked for the vacation of this tract in order that it may erect permanent buildings required by growth of the company's business.

PHILADELPHIA.—Pennsylvania Salt Mfg. Co. will build a 1-story, 15 x 55-foot power house.

PITTSBURGH. — Columbia Ice Co. will erect a $25,000, 1-story, concrete and fireproof building on Hamilton avenue.

PITTSBURGH, PA.—Pittsburgh Refrigerator Co. has filed a charter in Delaware to manufacture refrigerating machines of all kinds and install refrigerating plants. Incorporators: Herbert E. Latter, Norman H. Coffin, Wilmington, Del., and Clement M. Egner, Elkton, Ind.

WINDBER, PA.—Berwind-White Coal Co. will erect a new tipple at mine No. 37; this is necessitated by the recently erected auxiliary dump.

YARDVILLE, PA.—Chas. A. Comp will build a 2-story, 50 x 150-foot factory at Yardville.

YORK, PA.—County commissioners will replace wooden bridge over Red Run in Washington township with a steel structure; F. S. Bartenschloger is county comptroller.

EDGEWATER, N. J.—Aluminum Co. of America has broken ground in Edgewater for the new plant contemplated for some time. It is expected to cost about $1,000,000 and will be devoted to manufacturing aluminum cooking utensils, novelties, etc.

ELIZABETH, N. J.—E. H. Mumford Co. has been incorporated to manufacture molding machines, etc.; $50,000 capital stock; by Thomas J. Mumford and Rose S. Mumford.

Plainfield, N. J.; Howard W. Conclair, Elizabeth.

HAMBURG, N. J.—Bethlehem Steel Co., which has a limestone quarry at McAfee, near Hamburg, has awarded contracts for erecting at the quarry a brick office building and a combined machine shop, blacksmith shop and boiler room, 32 x 132 feet.

HOMESTEAD, N. J.—Atlas Finishing Co. has let a contract for its proposed 1-story power house.

NEWARK, N. J.—Sloan & Chace Mfg. Co., manufacturer of machinery and tools, is extending its manufacturing space.

NEWARK, N. J.—Jas. L. Mason is about to start work on a 3-story, brick factory building at 84 Delancy street.

NEWARK, N. J.—Universal Copper Works has let the contract for erecting a 1-story, 38 x 92-foot, brick factory building, at Walnut and McWhorter streets.

NEWARK, N. J.—John Sommer Faucet Co. has moved from its old quarters on Central avenue, near Morris avenue, into a new building in the rear of the old plant.

NEWARK, N. J.—Central Dyestuff & Chemical Co., which is erecting two additions to its plant in Plum Point lane, shortly will begin erecting a new 1-story power house, 54 x 67 feet.

NEWARK, N. J.—Sanitary Stove Top Co. has been incorporated to manufacture coal and electric ranges; $50,000 capital stock; by William W. Smith, William A. White, B. Carlyle Fenwick, Fayette P. Scoffield, and J. Hansburg Callaghan, all of Newark.

PERTH AMBOY, N. J.—Watson-Flagg Engineering Co. has been awarded the contract for constructing the proposed $150,000 municipal lighting plant.

PERTH AMBOY, N. J.—Standard Underground Cable Co. has begun the erection of its proposed $25,000, 75 x 175-foot addition, to be used for drawing brass wire and copper tubing. George W. Mercer Construction Co. is doing the work.

CENTRAL STATES

AKRON, O.—Paul E. Werner, Akron, has interested New York and Chicago capital in a $1,000,000 rubber company and expects to erect a factory near Kansas City, Mo.

BRYAN, O.—National Pipe Die Machine Co., recently incorporated at Archbold, O., with $10,000 capital stock; will erect and equip a factory within 90 days for the manufacture of a device invented by Ernest L. Rowe.

CANTON, O.—Zahner Metal Sash & Door Co. will start work at once on a 2-story office building. It is reported the company is considering also the erection of an 80 x 200-foot plant.

CINCINNATI.—Ideal Wheel Co. has increased its capital stock from $25,000 to $50,000.

CINCINNATI.—Bids will be taken soon by Walter Franz, consulting engineer, for power plant equipment for Miami University, Oxford, O.

CINCINNATI.—William Koehl Co., Jamestown, N. Y., manufacturer of boxes, will move its factory to Cincinnati shortly. A 4-story, concrete building, 100 x 100 feet, will be erected and some new equipment installed.

CINCINNATI. — Machinery requirements will be prepared soon by the Huenefeld Co., manufacturer of stoves and ranges, which is building a large addition to its plant on Spring Grove avenue.

CINCINNATI.—J. H. Day Co., manufacturers of baking, paint and confectioners' machinery, will build a $150,000 plant in Bond Hill; 75 acres of land have been purchased.

CLEVELAND.—American Fire Clay & Products Co., recently incorporated with $1,000,000 capital stock by Max P. Goodman and others, holds options on several large plants, sand banks and clay lands and will close at once.

Oh! What a Saving

"A tip in time saves nine."
With this philosophy at hand
We figure
A sales manager can make these 10 "happy hunches" do the work of 100, by
ACTING NOW.

Victor Typewriting Co., New York City, plans spending $900,000 for equipment for its proposed $400,000, 4-story plant, which will be erected on a recently purchased 10-acre site in Lawrence, Mass. It is planned to have the plant in operation by Nov. 1, 1916, capable of putting out 52,000 machines a year.

McKeesport Tin Plate Co., McKeesport, Pa., has sent out inquiries for steel for extensions to a half dozen buildings; nine cranes ranging in capacity from 5 to 20 tons; five engines to be rope driven; 20 tin plate mills; 20 squaring and 20 doubling shears and 72-inch bar shears.

Wetherell Stringing Machine Co., recently incorporated with $100,000 capital stock, will establish a plant in Fall River, Mass., to manufacture tag-stringing machines and to do general machine work. Frank L. Carpenter is president.

Klauder-Weldon Dyeing Machine Co., Amsterdam, N. Y., is having Peuckert & Wunder, Philadelphia, prepare plans for a one and 2-story, 200 x 250-foot addition to its plant.

Waterbury Farrell Foundry & Machine Co., Waterbury, Conn., has plans completed for a 3-story, 50 x 150-foot addition.

Union Switch & Signal Co., 30 Church street, New York City, is in the market for large amount of equipment for making projectiles.

Snead & Co. Iron Works, Jersey City, N. J., again is figuring on a large amount of equipment for making shells.

Webster & Perks Tool Co., Springfield, O., which will greatly enlarge its capacity by moving into the new Shuey manufacturing building in that city, is in the market for additional equipment, viz.: Lathes, shapers, milling machines, radial and plain drill presses, planer and other machine tools, also, transmission equipment, electric motors, steel lockers, bins, etc.

Ingersoll-Rand Co., 11 Broadway, New York City, is inquiring for a large quantity of equipment for making projectiles.
brick plant addition.

T. C. M. Mfg. Co., Harrison, N. J., manufacturer of automobile parts, is figuring on a war contract, and if it is obtained it will be in the market for a large number of hand millers and perhaps some other machinery.

CLEVELAND. — Packard-Cleveland Motor Co. has increased its capital stock from $40,000 to $60,000.

CLEVELAND.—Federal Gear Co. has been incorporated; $1,000 capital stock; by P. C. Kassulker, O. N. Shaver, R. Kornfield and J. and A. A. Stephens.

CLEVELAND.—Contracts will be let about June 15 on the construction of a $100,000, steel, brick and concrete addition to St. Alexis' hospital; W. C. Jansen, architect.

CLEVELAND.—Buckeye Amalgamating Co. has been incorporated; $100,000 capital stock; by F. Van Buskirk, A. W. Thomas, O. D. Smith, F. E. Genck and A. L. Lacey.

CLEVELAND. — Frazer Construction Co. has been incorporated; $10,000 capital stock; by J. M. Frazer, W. A. Ware, B. E. Frost, A. L. Brown and B. A. Frazer.

CLEVELAND. — Grant-Meriam-Ford Co., general contractor, has been incorporated; $50,000 capital stock; by Horatio Ford, A. A. McCaslin, G. D. McGwinn, D. H. Tilden, N. I. Young.

CLEVELAND.—Commissioner of purchases and supplies will receive bids until noon, June 9, for stud bolts and nuts for cast iron flanged pipe for Division avenue pumping station.

CLEVELAND.—National Acme Mfg. Co., manufacturer of screw machinery, will start work at once on the erection of a 6-story, 52 x 218-foot addition to its plant at 7531 Stanton avenue, also a 1-story, 67 x 194-foot structure. W. R. Mitchell is superintendent.

COLUMBUS.—Columbus Bolt Works Co. has been incorporated; $660,000 capital stock; by William F. Burdell, J. R. Poste, J. Hamilton Poste, Beale E. Poste and S. H. Barrett.

DAYTON, O.—Frank Hill Smith, architect, is finishing plans and expects to take bids shortly on the proposed $1,000,000 plant for the Merchantile corporation, Howard F. Marston, president.

EAST LIVERPOOL, O.—Columbia Sheet Steel Co. has been incorporated; $600,000 capital stock; by A. L. Petty, George M. Silger, T. V. Milligan, G. Sheckler, George Wright. This company, as recently mentioned, will erect a sheet mill in East Liverpool, employing about 450 men.

ELYRIA, O.—Cleveland interests recently have leased the J. W. Smith property and will establish a factory for sheet metal work and the manufacture of automobile accessories.

FOSTORIA, O.—Allen Motor Car Co. will erect a chassis assembly building providing 20,000 additional floor space, as soon as the site purchased can be cleared.

FREMONT, O.—Wanecek Strop & Cutlery Co. has been incorporated; $25,000 capital stock; by John B. Stahl, Wanda L. Wanecek, Frank E. Stahl, and Mamie G. Stahl.

GRANDVILLE, O.—Ohio Light & Power Co. has requested a franchise to furnish the city with electric light and power for domestic and commercial purposes.

HAMILTON, O.—County commissioners have extended the time for receiving bids from June 5 to June 9.

IRONTON, O.—All equipment has been purchased by the Belfont Iron Works Co., which is building an addition, 120 x 160 feet, for the manufacture of wire fencing.

LORAIN, O.—The city council will drop plans for a $350,000 municipal light plant and will receive bids from private companies for a contract to go into effect at the expiration of present contract.

MARIETTA, O.—Council favors a municipal light plant, but have not decided whether to recommend a plant for commercial service or for street lighting only.

MASSILLON, O.—Massillon Gas & Elec-

tric Co. has increased its capital stock from $500,000 to $750,000.

MIDDLETOWN, O.—Ohio Electric & Gas Co., with holdings at Leetonia and New Lisbon, O., will establish a central power station in the Great Miami valley to supply electricity and gas to a string of towns between Dayton, O., and Cincinnati. The first step in this project is the purchase of holdings of the Middletown Gas & Electric Co. for which improvements amounting to $42,000 are planned. The Ohio company also has applied for authority to purchase the following plants for prices indicated: Franklin Electric Light Co., $87,016.80; Leetonia Electric Co., $46,816.90; New Lisbon Gas Co., $58,762.60.

NEWARK, O.—The city has sold $240,000 bonds for grade crossing elimination.

ORRVILLE, O.—National Mine Machinery, represented by Messrs. Balcum and Naher, Akron, O., has purchased the old cloak factory building from the board of industry and is buying equipment.

PAINESVILLE, O.—A petition has been filed calling for a special election June 22 to vote on $35,000 bonds for improvements to the municipal light plant, according to plans of H. Whiteford Jones, engineer, Cleveland.

SANDUSKY, O.—Paul Swessinger, owner of building occupied by the Casswell Auto & Machine Co., recently damaged by fire with $20,000 loss, will replace the structure.

SANDUSKY, O.—Commercial club is investigating the proposition of J. Frank Hickerson, McComb, O., head of a company manufacturing cookers and heaters, capitalized at $25,000. The company has outgrown its quarters and desires to increase its capital to $50,000 and locate elsewhere.

SHELBY, O.—At a joint meeting of the council and board of public affairs it was decided to build a $40,000 municipal light plant.

SPRINGFIELD, O.—Clifton Plating & Mfg. Co. has been incorporated; $12,000 capital stock; W. H. Clifton, Edward F. Lacey and F. B. Luibel.

TOLEDO, O.—Fowler Electrical Construction Co. has been incorporated; $10,000 capital stock; by Harry R., Henry F. and Eleen F. Fowler, Carlton F. Jones, Horatio C. Scannell.

TOLEDO, O.—Hasse Mfg. Co., horseshoes, has been incorporated; $10,000 capital stock; by Paul L. Goodes, William J. Shasberger, Clarence C. Montis, Isaac F. Anderson and Philip J. Rowe.

WAVERLY, O.—I. B. Eyler, county auditor, will open bids June 14 for the construction of a 123-foot, steel span over Sunfish creek; plans with county engineer; certified check for $200 required.

WILMINGTON, O.—Brown Accessory Mfg. Co., automobile accessories, has been incorporated; $12,000 capital stock; by H. M. McCoy, Roy M. Brown, Luther C. Barnes, U G. Murrell, B. J. Haitt.

ZANESVILLE, O.—The county commissioners ask bids for the superstructure of Meadow Farm bridge in Springfield township; Fred C. Werner is clerk of commissioners.

CHARLESTON, W. VA.—Kanawha Mine Car Co. has received bids on a 1-story, 44 x 103-foot addition.

FAIRMONT, W. VA.—The city council contemplates erecting a bridge, 389 feet, over Coal Run and a bridge over the Monongahela river, 1,450 feet, to cost $400,000.

HUNTINGTON, W. VA. — Huntington Alloy Co., recently organized will erect a $25,000 plant.

NEW MARTINSVILLE, W. VA.—Bids are being asked by S. Meyers, county clerk, for the construction of a bridge, 36-foot span.

PARKERSBURG, W. VA.—Baltimore & Ohio railroad is having plans prepared by M. A. Long, Baltimore, engineer, for a $150,000, steel freight station, 40 x 700 feet, at Parkersburg, W. Vo.

ASHLAND, KY.—Ashland Electric Light & Power Co. is reported to have plans for improvements. It has increased its capitalization from $25,000 to $32,000.

BARBOURVILLE, KY.—T. W. Minton & Son, who recently established a woodworking plant for the manufacture of automobile and other vehicle rims, etc., have announced that the capacity of the factory will be doubled.

GLASGOW, KY.—Fire damaged the machine shop of W. C. Moss and caused severe loss at the Glasgow Marble works, the total loss being about $20,000.

HARLAN, KY. — The Harlan commercial club has information regarding a proposed power plant to cost $250,000, which it is said Cincinnati interests will establish.

HAWESVILLE, KY.—L. S. Powers is planning to establish sewer pipe plant on a tract of clay land which has just been opened.

LEXINGTON, KY. — Lexington Hydraulic & Mfg. Co. will let a contract for laying a 20-inch water main from its pumping station to Mentelle Park.

LOUISVILLE, KY.—Holly Ridge Lumber Co., operating a sawmill at Holly Ridge, La., is said to be planning the establishment of a planing-mill at Holly Ridge. W. A. Watts, Louisville, is president.

TOMPKINSVILLE, KY. — Tompkinsville Electric Light & Ice Co. has been incorporated with $10,000 capital stock by E. H. Smith and others, who recently bought the local electric light plant and will enlarge it, besides putting in ice machinery.

BLOOMINGTON, IND. — American Cast Iron Co., Chicago, has submitted a proposition to the city council for the construction of a water system, including the installation of boilers, engines, pumps, etc., and laying down the necessary pipe, for $90,000.

CHALMERS, IND.—T. C. Smith is engineer in charge of constructing an electric light system recently authorized by special election.

EVANSVILLE, IND.—J. C. Keller, secretary of the business men's association, has information about a gas engine concern which is planning to locate in Evansville.

GARY, IND.—Mihok Mfg. Co. has been incorporated to manufacture hand shovels and similar equipment; $25,000 capital stock; by W. Mihok, Peter Honorof and Steven Szalko.

HARTFORD CITY, IND.—American Window Glass Co. plans spending $100,000 on equipment for its plant in Hartford City, including 10 mixing and storage tanks, an overhead electric railway and two movable elevators also will be installed. Each concrete tank will have 1,000 tons capacity and mixing will be done by machinery.

INDIANAPOLIS.—The board of education has approved plans for a public library to cost $500,000 and will advertise shortly for tenders on bonds.

INDIANAPOLIS.—Public service commission has granted permission for the Union Traction Co. to issue bonds amounting to $50,557 for motors and other equipment.

INDIANAPOLIS.—Pathfinder Co. has been incorporated to manufacture automobiles; $250,000 capital stock; by Charles W. Richards, George W. Lufkin, Leo Laminsky, George E. Drawe and Marvin B. Rice.

JEFFERSONVILLE, IND.—Bids for furnishing the Depot Quartermaster at Jeffersonville with iron, steel, brass, copper, sheet tin, wire, bolts and stovepipe for delivery during the fiscal year 1916 will be received by the Quartermaster General in Washington June 22.

LAFAYETTE, IND. — Motsinger Device Mfg. Co. has increased its capital stock from $150,000 to $300,000.

LIGONIER, IND.—Banta & Bender Refrigerator Co.'s plant was burned recently with a loss of $40,000. The company made incubators and refrigerators. It plans to rebuild.

TERRE HAUTE, IND.—Mac's Mfg. Co., rotary engines, has been incorporated; $10,000 capital stock; by P. H. MacNeil, J. F. Weisman, M. N. Thayer.

ALTON, ILL.—Duncan Foundry & Machine Works has started construction of a plant at Piasa and Fifth streets.

BELLEVILLE, ILL.—Cabirange Mfg. Co. has been incorporated; $10,000 capital stock; by J. C. Klemme, George A. Kloess and Julius Kohl Jr.

BLOOMINGTON, ILL.—George Gildner is about to erect a $30,000, 3-story garage, 80 x 100 feet, after plans by George B. Rheinfrank, 601 Gardner building, Toledo, O.

CHICAGO.—Illinois Tool Works, 154 East Erie street, has increased its capital stock from $5,000 to $150,000.

CHICAGO.—Wm. Niel & Co., 611 West Division street, manufacturers of oil tanks, are to build a $3,000, 3-story addition.

CHICAGO.—Wilson Steel Products Co., 4844 South Western avenue, is building a $3,000, 1-story, brick addition.

CHICAGO.—Marshall & Fox, 38 South Dearborn street, are preparing tentative plans for a $1,000,000, 10-story hotel for Corbett & Connery.

CHICAGO.—Tunnel Engineering Co. has been incorporated; $15,000 capital stock; by Louis Mann Anderson, Ernest W. Hugging and Elizabeth R. King, 6529 Greenwood avenue.

CHICAGO.—W. J. Keene, president, Chicago Spring Butt Co., 340 Union Park place, is building an addition, five stories, 50 x 134 feet, to the plant of the Chicago Spring Butt Co.; estimated cost $30,000.

CHICAGO. — Swanstrom-Pneumatic Pump Co. has been incorporated to manufacture pumps; $2,500 capital stock; by Maurice Kozyne, Fremont, Arnsfield and James T. Fales, 69 West Washington street.

SPRINGFIELD, ILL.—State assembly has voted $140,000 for new heating and lighting equipment in the state capitol.

CONCORD, MICH.—The city council has authorized $86,000 in bonds for two bridges.

DETROIT.—Paige-Detroit Motor Car Co. is planning a 3-story, 60 x 500-foot addition.

DETROIT.—F. L. Jacobs & Co., 451 Guoin street, are building a 2-story addition.

DETROIT.—Northwestern Construction Co. has been incorporated; $10,000 capital stock; by John H. Stewart, Andrew W. Comstock, George A. Kennedy and John H. Nolan.

DETROIT.—Lieutenant Colonel Mason M. Patrick, United States district engineer, Detroit, will receive bids until June 30 for 350 tons of steel for the construction of the fourth lock at Sault Ste. Marie.

DETROIT. — Sharpe Aer-Motor Co. has been incorporated to manufacture motor-propelled vehicles; $50,000 capital stock; by William A. Sharpe, Henry E. and Oscar A. Peters.

DETROIT.—Automatic Balanced Valve Co. has been incorporated to manufacture valves and other appliances; $100,000 capital stock; by Charles Blakeley, Frank T. Lodge and William R. Brown.

LUDINGTON, MICH. — Sheridan and Sauble townships, Lake county, will erect an $800, steel bridge over Sauble river.

MILFORD, MICH. — The plant of the Michigan Auto Dash Co. recently destroyed by fire with a loss of $30,000, is to be rebuilt.

MOHAWK, MICH.—Mohawk Mining Co.

is considering installing an electric light and power plant this summer to serve the rock house, underground haulage and pumping.

MUSKEGON HEIGHTS, MICH. — Piston Ring Co. is making plans for an addition to its plant.

LAKE GENEVA, WIS.—Equitable Electric Light Co. has increased its capital stock from $9,000 to $150,000.

MILWAUKEE.—Portland Gas & Coke Co. has applied for a 25-year franchise in Milwaukee.

WABENO, WIS. — Wabeno Lighting Co. has been incorporated; $5,000 capital stock; by G. W. Jones, H. C. Humphrey, R. H. Jones.

WAUPUN, WIS.—Wisconsin Water, Light & Equipment Co. has been incorporated; $10,000 capital stock; by A. M. Baker, R. Schmitz, George W. France.

KANSAS CITY, MO.—Producers Refinery Co. has been incorporated to build and operate an oil refinery; $600,000 capital stock; by L. A. Oliver, F. M. Thwing and H. M. Evans.

KANSAS CITY, MO.—R. C. McAlpine, county engineer, is preparing plans for a steel and reinforced concrete bridge, which have been approved by the county commissioners, costing $500,000, half of which will be paid by the Metropolitan Railway Co.

KIRKSVILLE, MO.—An election will be held soon on issuing $70,000 in bonds for a street light electric system and improvements to the water works.

LIBERTY, MO.—This city is planning an electric light plant to cost $55,000. Inquiries should be addressed to the mayor.

LINN CREEK, MO.—Big Niangua Hydro-Electric Co., Thomas S. Ridge, general manager, 333 Ridge building, Kansas City, Mo., is to build a hydro-electric plant as soon as finances can be arranged, on the Big Niangua river. Estimated cost is $2,500,000 and construction will include a reinforced concrete dam, 1,500 feet long and 160 feet high to develop 30,000 horsepower to be delivered over a transmission line 120 miles long.

ROCKPORT, MO.—Bids will be received until June 10 by city clerk for constructing a water works costing $12,000. W. B. Rollins & Co., Midland building, Kansas City, Mo., are engineers.

ST. LOUIS.—Robinson Fire Apparatus Mfg. Co. has increased its capital stock from $225,000 to $325,000.

ALBERT LEA, MINN.—American Gas Machine Co. is planning extensive improvements to its foundry.

DES MOINES, IA.—Bensen & Marxer, 151 West Third street, have the general contract for a garage, two stories, 50 x 168 feet, costing $30,000, for the Hudson Jones Auto Co., S. W. Jones, president, 1118 Locust street.

MARSHALLTOWN, IA.—E. C. Carter, chief engineer, Chicago & North-Western railroad, Chicago, will take bids soon on a viaduct at Third avenue, 1,100 feet long.

SHELLSBURG, IA.—The city council is considering establishing a $10,000 electric plant.

CHISHOLM, MINN. — Work has been started by the Oliver Iron Mining Co. on a new shaft near the Great Northern station. A steel headframe and shops will be erected at once.

SOUTHERN STATES

VICKSBURG, MISS.—Bids will be received until June 15 by the United States engineer's office for steel lock gate valves, Poiree trestles, operating machinery, etc., aggregating about 450,000 pounds.

EL PASO, TEX.—Trost & Trost, architects, Mills building, are preparing plans for a 9-story, fireproof addition to the Paso Del Norte hotel owned by Z. T. White.

MINEOLA, TEX.—Mineola Ice, Light & Water Co., A. M. Dozier, secretary-treasurer, is about to enter into a contract with the city to install water mains and hydrants and a fire pump of 500 gallons per minute capacity.

WACO, TEX.—Waco Schaeffer Co. recently incorporated with $200,000 capital stock, is to build a plant for the manufacture of automobile engines.

BRISTOL, TENN.—The municipality has been authorized by the state legislature to issue $100,000 of bonds for the purpose of building an electric light plant.

KNOXVILLE, TENN.—J. M. Dunn & Son, Knoxville, have the contract for the steel and concrete buildings to be erected by the Tennessee Producers Marble Co. Stone-working equipment will be bought shortly.

MEMPHIS, TENN.—Chisca Mfg. Co. is being formed by the business men's club with $500,000 capital stock for the purpose of operating a cotton mill.

MEMPHIS, TENN. — Crawford-Williamson Co. is the building contractor for a cotton compress which involves the erection and equipment of a steam power plant.

MEMPHIS, TENN.—G. W. Simmons Co. is in the market for special equipment for its basket factory. Used machinery is to be given the preference.

MEMPHIS, TENN.—Henry Loeb, who has purchased the Bluff City Laundry, will add considerably to the special equipment. About $5,000 will be spent in improvements.

NASHVILLE, TENN. — Nashville Bridge Co. has the contract for the construction of a steel hull for a U. S. government lock-boat. It will be delivered at Carrollton, Ky.

TULLAHOMA, TENN.—Success Automatic Gate Co., manufacturer of farm gates, is making inquiry on prices of ¾-inch gas pipe in 12-foot lengths, ⅜-inch carriage and machine bolts, expansion coil wire springs, malleable iron and steel special castings and wire fencing 46 inches wide.

HANNA, OKLA.—A. A. Sing is planning to establish an electric light system in Hanna.

MADVILLE, OKLA. — Bounds Aeroplane Co. has been incorporated to manufacture aeroplanes; $3,500 capital stock; by Overton Bounds, J. E. McMillan and E. H. Baldwin.

TULSA, OKLA.—Huntington, Howard & Ash, engineers, Kansas City, Mo., have been authorized to make plans for a reinforced concrete bridge over the Arkansas river for which $200,000 in bonds has been voted.

TULSA, OKLA.—United Producers & Refining Co. has been incorporated; $300,000 capital stock; by James E. Dunn, of Tulsa, R. F. McMillen and B. C. McMillen, of Kansas City, Mo. An oil refinery will be erected.

WESTERN STATES

JAMESTOWN, N. D.—The city clerk is in charge of plans for a municipal electric light plant.

LISBON, N. D.—La Moure Construction Co., La Moure, N. D., has the general contract for an 80-foot steel span bridge with reinforced concrete floor.

O'NEILL, NEB.—Holt and Boyd county commissioners and the state highway commission are to build a 175-foot steel span approach to the bridge over the Niobrara river to replace one recently washed out. The cost is estimated at $10,000.

ST. PAUL, NEB.—The county commissioners are to erect a $45,000 bridge over the Loup river south of St. Paul.

LAWRENCE, KAN.—Hedrick & Cochrane, engineers, Kansas City, Mo., have before the county commissioners plans for a bridge over the Kaw river.

KELLOGG, IDA.—Guelph Mining Co. has ordered electric power, compressor, pumps, hoist and other machinery to be installed at once.

SUGAR CITY, IDA.—The contract for construction of the waterworks system which has been awarded to Carlson & Thompson, requires 2 miles of pipe, a 40,000-gallon, steel tank and motor.

COLFAX, WASH.—A move is under way to replace a 5-mile wood pipe line from Glenwood, Wash., to Colfax, with metal pipe line at an estimated cost of $60,000; Fred Dilr is water commissioner.

ELLENSBURG, WASH.—Bids will be received till 7:30 p. m., June 14, by the city treasurer for the purchase of $60,000 bonds for light plant extensions.

FRIDAY HARBOR, WASH.—Franchise has been granted to R. D. Burgheardt, Seattle, to operate an electric light plant in Friday Harbor, to be in operation within six months.

OLYMPIA, WASH.—Bids will be received till June 14 by the state highway board for constructing 486 feet of a steel cantilever bridge over the Cowlitz river at Mayfield, Wash., requiring about 190 tons of steel.

OLYMPIA, WASH.—State highway commission, Wm. R. Roy, Olympia, commissioner, has plans complete for the La Salle bridge, near Olympia, and will ask bids soon. The structure will be of steel, costing about $20,000.

BEND, ORE.—Oregon-Washington Railway & Navigation Co. and the Spokane, Portland & Seattle railroad will construct two miles of spur track from Bend and bridge across the Des Chutes river to reach site of mill to be constructed by the Shevlin-Hixon Mfg. Co., which will construct 6 miles of logging road.

EUGENE, ORE.—Two bridges, to cost about $11,000, probably will be constructed this season. Others that will receive consideration later will cost approximately $65,000.

PORTLAND, ORE. — Wood-Ewing Iron Works has been incorporated by R. B. Wood and L. H. Ewing, formerly with the John Wood Iron Works. Company has purchased interests and machinery of the North Star Iron Works and is located at 1371 Macadam street.

ST. HELENS, ORE.—According to plans prepared by E. I. Cantine, 1,130 feet of bridges are necessary to complete the Columbia highway in this county at an estimated cost of $54,000.

THE DALLES, ORE.—Oregon-Washington Railway & Navigation Co. will begin this month constructing its proposed $200,000 shops in The Dalles, including brick machine shops to accommodate 36 engines, power plant, two miles additional yard tracks, etc.

LOS ANGELES.—The city council is to create a special assessment district for a viaduct over the river and the Salt Lake & Santa Fe tracks.

BAKERSFIELD, CAL.—J. M. Dunn Auto Co. is to build a commercial garage and machine shop to cost $9,000. Parker Barrett is interested.

SONORA, CAL. — Gibson B. Kelly and George L. Gary have formed a company to develop the Buckeye mine in Table Mountain district. A mill and hoist will be installed.

TEHEMA, CAL.—Bonds for $10,000 have been voted for building a municipal water works plant.

RENO, NEV.—The city council is considering issuing $750,000 in bonds for a municipal electric plant and water works. J. C. Parry is city clerk.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to July 1.)

Bessemer, valley	$13.60
Bessemer, Pittsburgh	14.55
Basic, Pittsburgh	13.45 to 13.60
Basic, eastern Pa.	13.25
Malleable, Pittsburgh	13.45 to 13.95
Malleable foundry, Chicago	13.00
Malleable foundry, Philadelphia	15.00 to 15.25
Malleable foundry, Buffalo	12.50 to 13.00
No. 1X foundry, Philadelphia	14.25 to 14.50
No. 2 foundry, Pittsburgh	13.45 to 13.95
No. 2 foundry, valley	12.50 to 13.00
No. 2 foundry, Cleveland	13.00
No. 2 foundry, Ironton	12.50 to 12.75
No. 2 foundry, Chicago	13.00
No. 2X foundry, Philadelphia	14.00 to 14.25
No. 2X fdy., N. J. tidewater	14.25 to 14.50
No. 2X foundry, Buffalo	12.50 to 13.00
No. 2 plain, Philadelphia	13.75 to 14.00
No. 2 plain, N. J. tidewater	14.00 to 14.25
No. 2 plain, Buffalo	12.25 to 12.50
No. 2 southern, Birmingham	9.75 to 10.00
No. 2 southern, Cincinnati	12.65 to 12.90
No. 2 southern, Chicago	13.50 to 14.00
No. 2 southern, Phila. delivery	14.00 to 14.25
No. 2 southern, Cleveland	13.75 to 14.00
No. 2 south'n, New York docks	13.75 to 14.00
No. 2 southern Boston, docks	13.75 to 14.00
No. 2 south. interior, New Eng.	14.50 to 15.50
No. 2 southern, St. Louis	13.40
Virginia No. 2X furnace	12.50 to 13.00
Virginia 2X, Philadelphia	15.25
Virginia 2X, Jersey City	15.50
Virginia 2X, Boston points	15.75
Gray forge, eastern Pa.	13.25 to 13.50
Gray forge, Pittsburgh	13.20
Gray forge, Birmingham	8.75 to 9.00
Silveries, 8 per cent, Jackson, O.	14.75 to 15.25
Silveries, 5 per cent Birmingham	12.50
Silveries, 5 per cent, Chicago	16.35
Standard low phos., Phil.	19.00 to 20.00
Lebanon low phos., furnace	16.00 to 16.50
Low phos., Pittsburgh	20.95 to 21.20
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	15.25 to 16.25
Charcoal, Buffalo	15.75 to 17.00
Charcoal, Birmingham	25.00

IRON ORE

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.50
Old range, non-Bess., 51½ per cent	3.00
Mesabi non-Bessemer, 51½ per cent	2.85

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent	7c to 8¼c
For'n non-Bes., 50 to 65 per cent	7c to 8¼c

COKE

(At the ovens)

Connellsville furnace	$1.55 to 1.60
Connellsville fur. contr.	1.65 to 1.75
Connellsville foundry	2.00 to 2.40
Connellsville fdy. contr.	2.25 to 2.50
Wise county furnace	1.75 to 2.00
Wise county foundry	2.10 to 2.40
Pocahontas furnace	1.75 to 2.00
Pocahontas foundry	2.00 to 2.25
New River, foundry	2.50 to 3.00
New River, furnace	2.00 to 2.25

FERRO-ALLOYS

Ferro-mang., Balti.	$100
Ferro-mang. (future), Balti	....
Ferro-silicon, 50 per cent, Pbgh.	$71.00 to 73.00
Ferro-silicon, 50 per cent, Phila.	71.00 to 73.00
Ferro-sil., 12 to 13 per cent.	18.00 to 18.50
Ferro-sil., 11 to 12 per cent.	17.00 to 17.50
Ferro-sil., 10 to 11 per cent.	16.00 to 16.50
Ferro-sil., 9 to 10 per cent.	15.00 to 15.50

(Ferro-silicon quoted at furnace Ashland, Jackson and New Straitsville.)

Ferro-carbon titanium, carloads, per lb.	8c to 12½c

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$21.56 to 22.06
Forging billets, Phila.	24.56 to 25.06
Forging billets, Pbgh.	25.00

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.45
From Pittsburgh	.619
From Youngstown	.639
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Rates on sheet mill products $2 per ton higher.

Wire rods, Pittsburgh	$25.00
Billets, Pittsburgh	19.50 to 20.50
Billets, Youngstown	19.00 to 19.50
Sheet bars, Pittsburgh	20.00 to 21.00
Sheet bars, Youngstown	19.50 to 20.00
Muck bar, Pittsburgh	27.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh.	1.25c
Stand. open-hearth rails, Pbgh.	1.34c
Lgt. rails, 8-lbs., Pbgh. & Chgo.	1.22c
Lgt. rails, 12 lbs. Pbg. & Chgo.	1.17c
Lgt. rails, 16 to 20 lbs., Pgh. & Chgo.	1.12c
Lgt. rails, 25 to 45 lbs., Pbgh. and Chgo	1.07c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c
Angle bars, st. sections, Chicago	1.50c
Spikes, railroad, Pbgh.	1.35c to 1.40c
Spikes, railroad, Chgo.	1.50c
Track bolts, Pbgh.	1.85c to 1.90c
Track bolts, Chgo.	2.00c

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	3.00
New England	3.00
Philadelphia	2.79
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.00 to 1.50
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago, to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.47
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.20c
Structural shapes, Chicago	1.39c
Structural shapes, Philadelphia	1.359c
Structural shapes, New York	1.369c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chicago	1.29c to 1.39c
Tank plates, Pittsburgh	1.15c to 1.20c
Tank plates, Philadelphia	1.359c
Tank plates, New York	1.369c
Bars, soft steel, Pittsburgh	1.20c
Bars, soft steel, Chicago	1.39c
Bars, soft steel, Philadelphia	1.359c
Bars, soft steel, New York	1.369c
Hoops, carloads, Pittsburgh	1.25c to 1.30c
Bands, Pittsburgh	1.20c
Shafting, Pbgh., carload prompt	68 to 70 per cent off
Shafting, Pbgh., contr.	68 per cent off
Screw stks., Pgh. carl'ds,	68 to 70 per cent off
Bar iron, Chicago	1.15c to 1.20c
Bar iron, Philadelphia	1.175c to 1.225c
Bar iron, New York	1.15c to 1.20c
Bar iron, Cleveland	1.20c to 1.25c
Bar iron, Pittsburgh	1.20c to 1.25c
Hard steel bars, Chicago	1.20c to 1.25c
Smooth finish, mchy. steey, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	1.80c to 1.90c
No. 28, black, Chicago	1.89c to 1.94c
No. 28, tin mill, black, Pbgh.	1.85c to 1.90c
No. 28, galvanized, Pbgh.	3.60c
No. 28, galvanized, Chgo., nom.	3.94c
No. 10, blue, annealed, Pbgh.	1.35c
No. 10, blue, annealed, Phila.	1.459c to 1.509c
Tin plate, 100 lb., coke base	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pickl'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxidizing	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free from mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black.	Galv.
	Butt-weld.	
Steel, ¾ to 3 inches	79	68½
Iron, ¾ to 2 inches	71	57
	Lap-weld.	
Steel, 2½ to 6 inches	78	67½

BOILER TUBES

Steel, 3¼ to 4½ inches l. c. l.	74
Iron, 3½ to 4½ inches l. c. l.	62

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nails jobbers, Pittsburgh	$1.55 to 1.60
Plain wire, jobbers, Pittsburgh	1.35 to 1.40
Galvanized wire, jobbers, Pbgh.	1.85 to 1.90
Polished staples, Pbgh.	1.55 to 1.60
Galvanized staples, Pbgh.	2.05 to 2.10
Barb wire, painted, jobbers, Pbgh.	1.55 to 1.60
Barb wire, galv., jobbers, Pbgh.	2.05 to 2.10

IRON AND STEEL PRICES

Corrected up to Tuesday noon

BOLTS AND NUTS

(Delivered within 20-cent freight radius.)

Carriage bolts, ⅜ x 6 inches, smaller or shorter, rolled threads, 80 and 15; cut threads 80 and 10; larger or longer, 75 and 17½.

Machine bolts with hot pressed nuts ⅜ x 4 inches, smaller or shorter, rolled 80 and 20; cut, 80 and 15; larger or longer, 80.

Gimlet and cone point lag or coach screws, 85 and 2½.

Hot pressed square, blank or tapped nuts, $6.40 off list; hot pressed hexagon blank or tapped, $7.30 off.

Cold pressed square, blank or tapped, $6.10 off; hexagon, blank or tapped, ⅜ inch and larger, $7.50; ⅜-inch and smaller, $8.00.

RIVETS

Structural rivets, Pbgh	1.45c to1.50c
Structural rivets, Chgo	1.68c
Boiler rivets, Pbgh	1.55c to 1.60c
Boiler rivets, Chgo	1.78c

STEEL SHEET PILING

(Pittsburgh.)

Base sizes	1.55c to 1.60c

COLD ROLLED STRIP STEEL

(Subject to regular extras.)

0.10 to 0.19 Carbon.	Base price Cut to length	
	Hard.	Soft.
1½ inch and wider	2.85	3.10
0.100 and thicker	2.95	3.20
0.050 to 0.099 inc.	3.10	3.35
0.035 to 0.049 inc.	3.35	3.75
0.031 to 0.034 inc.	3.60	4.00
0.025 to 0.030 inc.	3.80	4.20
0.020 to 0.024 inc.	4.70	5.20
0.017 to 0.019 inc.	5.10	5.60
0.015 and 0.016	5.95	6.45
0.013 and 0.014	6.55	7.05
0.012	6.90	7.40
0.011	7.25	7.75
0.010	Coils.	
0.100 and thicker	2.75	3.00
0.050 to 0.099 inc.	2.80	3.05
0.035 to 0.049 inc.	2.95	3.20
0.031 to 0.034 inc.	3.10	3.50
0.025 to 0.030 inc.	3.20	3.60
0.020 to 0.024 inc.	3.30	3.70
0.017 to 0.019 inc.	3.60	4.10
0.015 and 0.016	4.00	4.50
0.013 and 0.014	4.70	5.20
0.012	5.05	5.55
0.011	5.40	5.90
0.010	5.75	6.25

CAST IRON WATER PIPE

Six to 48-in., Cleveland	23.75
Four-inch, Chicago	25.50
Six to 12 inches, Chicago	23.50
Large sizes, Chgo	23.00
Six-inch, New York	20.50 to 21.50
Four-inch, New York	21.50 to 22.50
Four-inch, Birmingham	20.50
Six-inch and larger, Birmingham	18.50

Gas pipe, $1 per ton higher than water.

WAREHOUSE PRICES

Steel bars, Chicago	1.65c
Steel bars, Cleveland	1.80c
Steel bars, Cincinnati	1.75c to 1.80c
Steel bars, Philadelphia	1.70c
Steel bars, New York	1.80c
Steel bars, St. Louis	1.70c
Iron bars, Chicago	1.65c
Iron bars, Cleveland	1.75c
Iron bars, St. Louis	1.65c
Iron bars, Cincinnati	1.70c to 1.80c
Iron bars, Philadelphia	1.55c
Iron bars, New York	1.65c to 1.70c
Hoops, Chicago	2.15c
Shapes and plates, Chicago	1.75c
Shapes and plates, Cleveland	1.90c
Shapes and plates, Cincinnati	1.85c to 1.90c
Shapes and plates, St. Louis	1.80c
Shapes and plates, Philadelphia	1.70c
Shapes and plates, New York	1.85c
No. 10 blue anl. sheets, Chgo	1.95c
No. 10 blue anl. sheets, Cleve	2.05c
No. 10 blue anl. sh. St. Louis	2.00c
No. 10 blue anl. sheets, Cinci	2.00c
No. 28 black sheets, Chgo	2.45c
No. 28 black sheets, Cleveland	2.45c
No. 28 black sheets, Cincinnati	2.45c to 2.55c
No. 28 black sheets, St. Louis	2.55c
No. 28 galv. sheets, Chgo	4.00c
No. 28 galv. sheets, Cleveland	3.90c
No. 28 galv. sheets, Cincinnati	3.40c to 3.55c
No. 28 galv. sheets, St. Louis	3.75c

Freight Rates, Coke

Connellsville regions, per 2,000 lbs., to:—	
Baltimore	$1.80
Buffalo	1.85
Chicago	2.50
Cleveland	1.60
Detroit	2.10
East St. Louis	2.80
Joliet	2.50
Louisville	2.50
Milwaukee	2.70
New York	2.85
Philadelphia	2.05
Pittsburgh	.75
Richmond, Va.	2.94
Toledo	1.85
Valley Furnaces	1.20
Cincinnati	2.00

IRON AND STEEL SCRAP

(Net Tons.)

No. 1 railroad wrought, Chgo	$ 8.75 to 9.25
No. 1 railroad wrought, Cleve	9.25 to 9.50
No. 1 railroad wrought, St. L	7.75 to 8.00
No. 1 railroad wrought, Cincin	7.50 to 8.00
No. 2 railroad wrought, Chgo	8.25 to 8.50
No. 2 railroad wrought, St. L	7.25 to 7.50
Arch bars and transoms, Chgo	12.00 to 12.50
Arch bars and transoms, St. L	10.50 to 11.00
Knuckles, coup. & spr'gs, Chgo	8.75 to 9.00
Knuckles, coup. & spr'gs, St. L	8.00 to 8.50
Shafting, Chicago	11.75 to 12.25
Shafting, St. Louis	10.50 to 11.00
Steel car axles, Chicago	10.25 to 10.75
Steel car axles, St. Louis	10.00 to 10.25
Locomotive tires, Chicago	8.50 to 9.00
Locomotive tires, St. Louis	8.75 to 9.00
Cut forge, Chicago	8.25 to 8.75
Pipes and flues, Chicago	6.25 to 6.75
Pipes and flues, Cleveland	7.25 to 8.00

Freight Rates, Finished Material

From Pittsburgh, carloads, per 100 lbs. to:—	
New York	16.9 cents
Philadelphia	15.9 cents
Boston	18.9 cents
Buffalo	11.6 cents
Baltimore	15.4 cents
Cleveland	10.5 cents
Cincinnati	15.8 cents
Chicago	18.9 cents
Minneapolis and St. Paul	32.9 cents
Denver	68.6 cents
St. Louis	23.6 cents
New Orleans	30 cents
Birmingham	45 cents
Pacific coast, (all rail)	80 cents
Pacific coast, via Panama canal	61.9 cents

Pipes and flues, St. Louis	6.00 to 6.25
No. 1 cast, Chicago	9.00 to 9.25
No. 1 cast, Cleveland	10.00
No. 1 cast, Cincinnati	8.50 to 9.00
No. 1 cast, St. Louis	8.75 to 9.00
No. 1 busheling, Chicago	7.25 to 7.75
No. 1 busheling, Cleveland	8.25 to 8.50
No. 1 busheling, Cincinnati	6.00 to 6.50
No. 1 busheling, St. Louis	6.75 to 7.00
No. 2 busheling, Chicago	6.00 to 6.50
No. 1 boiler plate, cut, Chgo	5.50 to 5.75
No. 1 boiler plate, cut, St. L	5.25 to 5.50
Boiler punchings, Chicago	8.25 to 8.75
Cast borings, Chicago	5.25 to 5.50
Cast borings, Cleveland	6.00 to 6.25
Cast borings, Cincinnati	4.75 to 5.25
Cast borings, St. Louis	5.25 to 5.50
Machine shop turnings, Chicago	5.00 to 5.50
Machine shop turnings, Cleve	6.00
Machine shop turnings, Cinci	$ 4.25 to 4.75
Machine shop turnings, St. L	5.50 to 5.75
Malleable agricultural, Chicago	7.50 to 7.75
Malleable agricultural, St. Louis	5.50 to 6.00
Malleable, railroad, Chicago	7.75 to 8.25
Malleable, railroad, Cincinnati	6.00 to 6.50
Malleable, railroad, St. Louis	6.25 to 6.50
Angle bars, iron, Chicago	11.75 to 12.25
Angle bars, iron, St. Louis	10.00 to 10.50
Angle bars, steel, Chicago	8.25 to 8.50
Angle bars, steel, St. Louis	8.00 to 8.25
Stove plate, Chicago	7.75 to 8.00
Stove plate, Cleveland	8.00 to 8.25
Stove plate, Buffalo	8.25 to 8.75
Stove plate, Cincinnati	6.00 to 6.50
Stove plate, St. Louis	6.00 to 6.25
Bundled sheet, Cincinnati	4.75 to 5.25

(Gross tons.)

Heavy melting steel, Pbgh	$11.75 to 12.00
Heavy melting steel, Buffalo	10.50 to 11.00
Heavy melting steel, Chgo	9.25 to 9.50
Heavy melting steel, Cleveland	10.25 to 10.60
Heavy melting steel, Cincinnati	8.50 to 9.00
Heavy melting steel, eastern Pa	11.00 to 11.50
Heavy melting steel, New York	8.75 to 9.00
Heavy melting steel, St. Louis	9.00 to 9.50
Grate bars, Buffalo	9.00 to 9.50
Grate bars, New York	6.50 to 7.00
No. 1 railroad wrought, east. Pa	12.50 to 13.00
No. 1 railroad wrought, Pbgh	10.25
No. 1 R. R. wrght., New York	10.50 to 11.00
No. 1 R. R. wrought, Buffalo	10.50 to 11.00
Shafting, New York	13.00 to 13.50
Shafting, eastern Pa	15.00 to 15.50
Wrought pipe, New York	8.25 to 8.50
Wrought pipe, eastern Pa	10.50 to 10.75
Mch. shop turnings, New York	6.00 to 6.25
Machine shop turnings, Buffalo	5.75 to 6.25
Mch. shop turnings, Pbgh	8.00 to 8.25
Mch. shop turnings, eastern Pa	8.25 to 8.50
Cast borings, New York	6.00 to 6.25
Cast borings, eastern Pa	8.00 to 8.25
Cast borings, Buffalo	6.50 to 6.75
Cast borings, Pittsburgh	8.50 to 8.75
Stove plate, N. J. points	8.50 to 9.00
Stove plate, Pittsburgh	8.25 to 8.75
Stove plate, eastern Pa	9.00 to 9.50
Shoveling steel, Chicago	8.75 to 9.50
Shoveling steel, St. Louis	8.00 to 8.25
Reroll. rails, 5 ft. & ov., Pbgh	12.00 to 12.50
Reroll. rails, 5 ft. & ov., Chgo	10.00 to 10.50
Reroll. rails, 5 ft. & ov., Cleve	10.50 to 11.00
Reroll. rails, 5 ft. & ov., E. Pa	11.50 to 12.00
Reroll. rails, 5 ft. & ov., St. L	10.00 to 10.25
Steel rails, short, Chicago	10.00 to 10.50
Steel rails, short, Cleveland	11.00 to 11.50
Steel rails, short, St. Louis	9.25 to 9.50
Iron rails, Cleveland nom	11.75 to 12.00
Iron rails, Chgo	12.00 to 12.50
Iron rails, Cincinnati	10.25 to 10.75
Iron rails, St. Louis	10.00 to 10.50
Iron rails, Pittsburgh (nom.)	12.50 to 13.00
Frogs, switches, guards, Chgo	9.25 to 9.50
Frogs, switches, guards, St. L	9.00 to 9.25
Car wheels, (iron), Pittsburgh	11.50
Car wheels, (steel), Pittsburgh	12.25 to 12.50
Car wheels, Chicago	9.75 to 10.00
Car wheels, eastern Pa	10.75 to 11.25
Car wheels, Buffalo	10.00 to 10.50
Car wheels, N. J. points	9.50 to 9.75
Car wheels, St. Louis	9.75 to 10.00
Iron axles, Pittsburgh	17.50
Iron axles, Cincinnati	19.00 to 20.00
Iron axles, eastern Pa	18.50 to 19.00
Iron axles, Chicago	15.25 to 15.75
Iron axles, Buffalo	16.00 to 16.50
Iron axles, St. Louis	13.50 to 14.00
Steel car axles, New York	13.50 to 14.00
Steel car axles, Buffalo	12.00 to 12.50
Steel car axles, Cleveland	12.00 to 12.50
Steel car axles, eastern Pa	14.00 to 14.50
No. 1 busheling, Buffalo	8.50 to 9.00
No. 1 busheling, Pittsburgh	9.75 to 10.00
No. 2 busheling, Buffalo	6.50 to 7.00
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Low phos. steel, eastern Pa	14.00 to 15.00
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No. 1 cast, eastern Pa	12.00 to 12.50
No. 1 cast, Pittsburgh	11.75 to 12.00
No. 1 heavy cast N. J. points	11.50 to 11.75
Mall. railroad, Cleveland	10.00 to 10.25
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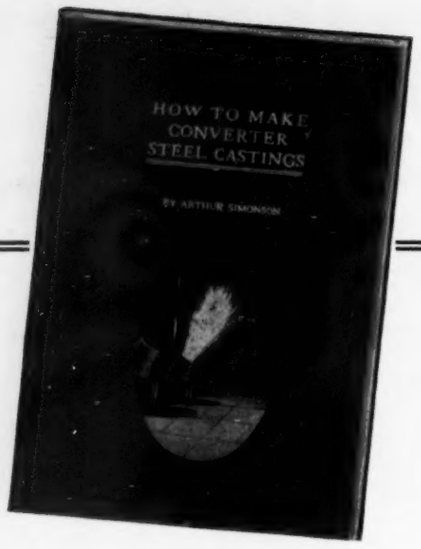
Malleable railroad, Buffalo	9.50 to 10.00
Malleable railroad, east Pa	9.25 to 9.75
Bundled sheet, Pittsburgh	9.00
Bundled sheet, Cleveland (nom.)	7.75 to 8.25
Bundled sheet, Buffalo	7.00 to 7.50



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PENTON'S BOOK NEWS

Cleveland, Ohio

101

The Utilization of Time Study Data

(*Continued from page* 1113.)

at the business of making chips for the greatest possible length of time, and it is only while it is making chips that a machine is making money for its owner.

The second item is the value of time study in increasing the relative producing time of the machine. In part, this has been discussed previously. The particular feature in mind, however, is that the handling time in machine work bears a much greater proportion to the total machine time than is commonly realized. Little is gained by standardizing our machines so that we can use Mr. Barth's slide rules and set speeds and feeds which will reduce the time required in removing metal by 10 or 15 per cent, if, at the same time, we do not set an equally high standard for the necessary but unprofitable, from the standpoint of machine earning capacity, work of handling and manipulation.

If we decrease the cutting time 10 per cent, but at the same time do not check the workman up on his handling time so that he increases it 15 per cent, to be sure that he will not produce too much in a day and, therefore, suffer a cut in rate, we have actually lost money if the ratio of handling and machine time is about that shown in the example given. By itemizing the handling operations and setting unit times which have been carefully determined by elementary time study, we have furnished a standard of performance to which we can hold the workman. The standard is not an unfair one because it has been determined by the performance of other workmen and if the time study has been accurately made, it can easily be attained by the ordinary good man.

The mere fact that there is a standard by which the performance of the workman can be measured, will in itself tend to increase the effort of the man to do his best. The standard being present, any failure to attain it can be investigated and the particular point wherein the man failed can be indicated to him, and his fault corrected. It has been found frequently that where this standard of performance has been omitted, the handling time in all machine work has gradually increased with a consequent decrease in the relative producing capacity of the machine.

How to Prepare Instructions

In preparing an instruction card from tabulated elementary time study data, the best method is for an instruction card man, who by the way should be a man well versed in the best methods of his trade, to dictate to a stenographer or clerk the elementary operations for the performance of the job in hand. After writing the card, the stenographer or some other clerk takes it to the time-study data file and fills in the elementary unit times from the recorded data.

This method not only saves the time of the high-priced instruction card man, who can render his best service by preparing cards and improving methods, but it also insures that accurate times will be set on the cards. The instruction card man is too apt to attempt to trust to his memory for certain unit times which recur more or less often. In addition, there is more or less tendency for him to use his judgment in certain cases as to the proper time rather than take the trouble to look it up in the files. Either condition is conducive to inaccurate rate setting. By entrusting the actual entering of the unit times to a clerk who knows nothing about machine work and who has only to copy figures from established records, this tendency to error is avoided.

The Dodge Sales & Engineering Co., Mishawaka, Ind., has opened a new warehouse in Providence, R. I., the location

being 171 Pine street. The building is located in the heart of the manufacturing district at Providence and is large enough to carry a good-sized stock of Dodge transmission products. W. B. Morse, of the Boston sales staff, has been placed in charge of the Providence warehouse, which will be managed under the direction of J. T. Dickenson, district sales manager of Boston.

Development of the Merchant Mill

(*Continued from page* 1131)

out 750 gross tons of ¾-inch rounds.

Another type of mill for heavier sections is shown in Fig. 9. This mill is used for producing sections too stiff to be turned in by hand and is entirely automatic in operation, no roller tables or mechanical transfers being used. The first successful employment of mechanical repeaters on both sides of a merchant mill train was made in a mill of this type. One of these mills produces more than 150,000 tons of bars per annum.

For rolling heavier merchant sections there are several types of improved mills, notably the three-high mill with traveling roller tables, and the Slick cross-country mill with stationary roller tables. These mills permit of the maximum flexibility and produce large tonnages. The tendency of the times, however, is to revert to the two-high construction of the original Cort mill for all kinds of rolling, on account of its simplicity and great stiffness.

Recent Improvements

From the beginning two fundamental difficulties have obtained in all general merchant mills, due to the wide range of section required to be rolled on a given mill, and the problem for the future to solve is the elimination of these difficulties, which are as follows:

First.—Lost time during roll changes.

Second.—Extreme variation in output from light to heavy sections.

Spare finishing trains seem to be the remedy for the first. Speed changes can be employed to only a limited extent to correct the second trouble, and therefore it seems necessary to increase or decrease the number of strands rolled in inverse proportion to the weight of bar to be rolled. For 8-inch, 9-inch and 10-inch mill work, the arrangement of rolls shown in Figs. 10 and 12 seems to offer a simple solution of both of these difficulties.

Improvement in mill construction, together with the perfection of the art of roll design and guide design, has made possible the production of sections of almost unbelievable accuracy; but the insistent demand of many buyers of steel for extreme exactness of round sections has made it necessary to provide means for rolling hot rounds with almost the accuracy of cold-drawn bars.

To meet this new requirement of the steel trade, a special mill has been evolved with which the general trade may not be familiar, although it has been in successful operation for some months. This new mill, curiously enough, works upon the same principle as employed in the original merchant mill for securing an accurate and true round, but, of course, without reverting to hand labor. Two pairs of rolls set at 90 degrees to each other are mounted so close together in a common housing that the leading pair performs the function of the man with the tongs on the old two-high hand mill. As in the old-time mill, a round bar slightly larger in area than the finished bar is first made in the regular way and then passed through the sizing mill, which is located between the regular finishing train and the cooling bed, as shown in Fig. 11. The usual best rolling practice of plus or minus about 0.007-inch in diameter has been reduced by this machine 50 per cent.

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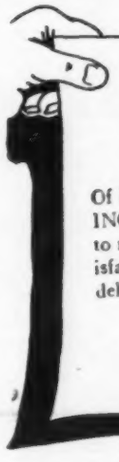
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STEEL FOUNDRY SUPERINTENDENCY by aggressive, competent man; crucible, electric or open hearth plants preferred. Expert knowledge of mixtures, melting, molding, casting and cost. Savings effected; refinements introduced. Address Box 410, THE IRON TRADE REVIEW, Cleveland, O.

PURCHASING AGENT AND COST accountant desires position; 32 years of age; 12 years' experience in large manufacturing plants. Highest references as to ability and character. Address Box 327, THE IRON TRADE REVIEW, Cleveland, O.

YOUNG MAN OF GOOD APPEARANCE and address, having ten years experience in the manufacture of open hearth steel, at present assistant superintendent of plant, desires change to a steel or manufacturing company which wants a hustler to understudy business; would like change to sales department; have high executive ability; can organize and handle all kinds of labor with efficiency; correspondence solicited. Address Box 418, THE IRON TRADE REVIEW, Cleveland, O.

OPERATING SUPERINTENDENT AND efficiency executive of crucible, electric and open hearth steel plants and rolling mills, fully qualified by seventeen years successful plant management experience, desires position wherein practical metallurgical, producing, economic, statistical and financial experience are required. Address Box 409, THE IRON TRADE REVIEW, Cleveland, O.

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15 years manufacturing experience; 4 years under F. W. Taylor at Bethlehem Steel. Experienced in all departments, shop, design, office and management. Not merely a system man but a practical experienced organizer, sure of results if proposition is undertaken. Have organized several plants that were not making proper returns and have demonstrated results that were unusual. Have turned bad losses into profits the first year. Can get and fill contracts for war material if machinery is suitable. Will only consider proposition of some size that is financially sound. Have clean past record. Technical graduate. Address Box 447, THE IRON TRADE REVIEW, Cleveland, O.

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